



Preliminary Assessment

for

RCRA Corrective Action Program

GAF Linden
Dupont Rd. Foot of Wood Ave.
Linden, Union County, NJ

N. J. Department of Environmental Protection
Divisions of Environmental Quality
Waste Management
Water Resources

Prepared by the Division of Waste Management
Bureau of Hazardous Waste Planning &
Classification
November, 1985

101359



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

I. IDENTIFICATION

01 STATE 02 SITE NUMBER

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, historical or other name of site) GAF		02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER Dupont Rd Foot of Wood Ave.			
03 CITY Linden	04 STATE NJ	05 ZIP CODE 0703	06 COUNTY Union	07 COUNTY CODE 20	08 CONG DIST
09 COORDINATES LATITUDE 40 36 43.2		LONGITUDE 74 12 50.2			
10 DIRECTIONS TO SITE (bearing from nearest public road)					

III. RESPONSIBLE PARTIES

01 OWNER of property GAF		02 STREET (Address, mailing, recorded) 1361 ALPS Rd.			
03 CITY Wayne	04 STATE NJ	05 ZIP CODE 07470	06 TELEPHONE NUMBER (201) 668-3504		
07 OPERATOR (if known and different from owner)		08 STREET (Address, mailing, recorded)			
09 CITY	10 STATE	11 ZIP CODE	12 TELEPHONE NUMBER ()		
13 TYPE OF OWNER (Check all that apply) <input checked="" type="checkbox"/> A. PRIVATE <input type="checkbox"/> B. FEDERAL <input type="checkbox"/> C. STATE <input type="checkbox"/> D. COUNTY <input type="checkbox"/> E. MUNICIPAL <input type="checkbox"/> F. OTHER <input type="checkbox"/> G. UNKNOWN					
14 OWNER/OPERATOR NOTIFICATION ON FILE (Check all that apply) <input type="checkbox"/> A. RCRA 3001 DATE RECEIVED: / / <input type="checkbox"/> B. UNCONTROLLED WASTE SITE (RCRA 103) DATE RECEIVED: / / <input type="checkbox"/> C. NONE					

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION <input checked="" type="checkbox"/> YES DATE: / / 86 <input type="checkbox"/> NO		02 BY (Check all that apply) <input type="checkbox"/> A. EPA <input type="checkbox"/> B. EPA CONTRACTOR <input checked="" type="checkbox"/> C. STATE <input type="checkbox"/> D. OTHER CONTRACTOR <input type="checkbox"/> E. LOCAL HEALTH OFFICIAL <input type="checkbox"/> F. OTHER: CONTRACTOR NAME(S):			
03 SITE STATUS (Check one) <input checked="" type="checkbox"/> A. ACTIVE <input type="checkbox"/> B. INACTIVE <input type="checkbox"/> C. UNKNOWN		04 YEARS OF OPERATION 1900's Present UNKNOWN			
05 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN OR ALLEGED Mercury, Dichlorobenzene, Phenol, Toluene, Dioxane, Silver, Arsenic, Propylene, Oxide. benzene					
06 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION Groundwater, soil and surface water contamination on site documented.					

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one. If high or medium is checked, complete Part 2 - Waste Identification and Part 3 - Assessment of Hazardous Conditions and Impacts) <input type="checkbox"/> A. HIGH <input type="checkbox"/> B. MEDIUM <input type="checkbox"/> C. LOW <input type="checkbox"/> D. NONE			
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VI. INFORMATION AVAILABLE FROM

01 CONTACT Robert Patel	02 OF (Agency or Organization) NJDEP/BDWE	03 TELEPHONE NUMBER ()		
04 PERSON RESPONSIBLE FOR ASSESSMENT Richard Gervasio	05 AGENCY NJDEP	06 ORGANIZATION DEWM/BSA	07 TELEPHONE NUMBER 609 12927696	08 DATE / /

1. BASIC PROCESS/UNIT CHARACTERISTICS

	1) SWMU TYPE	2) LOCATION	NO. OF UNITS OF THIS 3) TYPE	4) AMOUNT/SIZE	KNOWN 5) ALLEGED	RCRA/ NPDES 6) STATUS	UNITS EXHIBITING OBSERVED OR 7) SUSPECTED RELEASE
A. Landfill	A	I-4 J-8	2	6 acre 10-12 acre	Known	Registered	Observed
B. Surface Impoundment	B	N-9 I-8	2	Unknown	Alleged	None	Suspected
C. Waste Pile							
D. Land Treatment Unit							
E. Injection Well							
F. Incinerator							
TANKS							
G.1 Above Ground	G-1	M-9	1	6,000 gal.	Known	Permitted	None
G.2 Underground							
H. Container Storage Unit	H	6-7 H-6	2	Unknown	Known	Waiting approval in closure process	
I. Other	LWMF	N-9	1		Known	Permit	Observed

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SUB
TYPE

Building #207

Hazardous Waste
container Storage

COMMENT

Building 207 ready for use drains blocked and door ways diked. Waiting for approval
to be used.

Surface Impoundment

Area used to discharge arsenic acid waste from over head sewer line also iron sludge
area now used to store building debris and drums.

Surface Impoundment

Area is now site of Waste Treatment Plant. Dilute sulfuric acid residue from alpha
athraquiones which contain mercuric sulfate and traces of entrained metallic mercury
drained from building #49 via drainage ditch system to this area known as tract #9.

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ADDITIONAL COMMENTS

SITU
TYPE

COMMENT

N-9 Industrial Waste
Management Facility

Includes oil-water skimmer, to remove waste oil from waste lagoon. Oil storage tank-
6000 gal used to store skimmed waste water oil. Lagoon oil manifested off site
urned oil needs to be classified.

I-8 Old Landfill

Observed release to both ground water and soil stand pipes on landfill have oil on ws
GAF admits to dumping chemicals off spec product, also alledged dumping of clorinated
Hydrocarbons.

I-4 Drum Landfill

Alledged dumping of arsenic acid residue and iron sludges from sulfunicated
anthraquinones, process, also buried drums visable on various inspections.

H-6 Building 53
Hazardous Waste Container
Storage

This building in closure porcess. Building clear of all waste. Proposed new storage
area Building 207 ready, not approved.

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SOLID WASTE MGMT. UNIT Old LandfillLOCATION J-8POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE 02 SITE NUMBER

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ☐ A. GROUNDWATER CONTAMINATION 12 02 ☐ OBSERVED (DATE: 1983) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 12 04 NARRATIVE DESCRIPTION
Monitoring wells of LF show metals, VO contamination standpipes in surficial fill on LF contain oily liquid layer.

01 ☐ B. SURFACE WATER CONTAMINATION 02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 04 NARRATIVE DESCRIPTION
Landfill in existence before IWME, b contaminates from LF run to Authur Kill and Piles Creek via ditch system.

01 ☐ C. CONTAMINATION OF AIR 02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 04 NARRATIVE DESCRIPTION

01 ☐ D. FIRE/EXPLOSIVE CONDITIONS 02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 04 NARRATIVE DESCRIPTION

01 ☐ E. DIRECT CONTACT 02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 04 NARRATIVE DESCRIPTION

01 ☐ F. CONTAMINATION OF SOIL 02 ☐ OBSERVED (DATE: 1983) ☐ POTENTIAL ☐ ALLEGED
03 AREA POTENTIALLY AFFECTED: 12 04 NARRATIVE DESCRIPTION
(Area)
Soil boring in LF show metals VO contamination.

01 ☐ G. DRINKING WATER CONTAMINATION 02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 04 NARRATIVE DESCRIPTION

01 ☐ H. WORKER EXPOSURE/INJURY 02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
03 WORKERS POTENTIALLY AFFECTED: 04 NARRATIVE DESCRIPTION

01 ☐ I. POPULATION EXPOSURE/INJURY 02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 04 NARRATIVE DESCRIPTION

SOLID WASTE MGMT. UNIT Old Landfill

LOCATION

J-8



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE 02 SITE

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ☐ J. DAMAGE TO FLORA 02 ☒ OBSERVED (DATE: 1986) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

No growth on large portions of landfill.

01 ☐ K. DAMAGE TO FAUNA 02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION (INCLUDE NATURE OF DAMAGE)

01 ☐ L. CONTAMINATION OF FOOD CHAIN 02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ M. UNSTABLE CONTAINMENT OF WASTES 02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
(Spills, Leaks, Burning, Emissions, Leaking Drums)
03 POPULATION POTENTIALLY AFFECTED: 04 NARRATIVE DESCRIPTION
Dumping of chemical wastes on LF ground water soils contaminated. Standpipes have oily layer of water

01 ☐ N. DAMAGE TO OFFSITE PROPERTY 02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs 02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ P. ILLEGAL/UNAUTHORIZED DUMPING 02 ☒ OBSERVED (DATE: 1970) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
Facility admits to dumping of chemical wastes including highly chlorinated hydrocarbons.

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

III. TOTAL POPULATION POTENTIALLY AFFECTED:

IV. COMMENTS

V. SOURCES OF INFORMATION (See specific references, e.g., State files, sample analysis results)

POTENTIAL H.
PRELIMINARY
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTSIDENTIFICATION
01 STATE 02 SITE NUMBER

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ☒ A. GROUNDWATER CONTAMINATION 02 ☒ OBSERVED (DATE: 1983) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION
Monitoring wells down grade of LF show metals, VO contamination.

01 ☐ B. SURFACE WATER CONTAMINATION 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION
Area was site of arsenic acid disposed before Piles Creek was dammed at Dupont Ave.
it intruded into this area and was allegedly affected.

01 ☐ C. CONTAMINATION OF AIR 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

01 ☐ D. FIRE/EXPLOSIVE CONDITIONS 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

01 ☐ E. DIRECT CONTACT 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

01 ☐ F. CONTAMINATION OF SOIL 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 AREA POTENTIALLY AFFECTED: 6 04 NARRATIVE DESCRIPTION
Alleged dumping of drummed material and arsenic acid residues overflow from
over head sewer line

01 ☐ G. DRINKING WATER CONTAMINATION 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

01 ☐ H. WORKER EXPOSURE/INJURY 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 WORKERS POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

01 ☐ I. POPULATION EXPOSURE/INJURY 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

SOLID WASTE MGMT. UNIT Drum LandfillLOCATION I-4POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE 02 SITE NUMBER

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ☐ J. DAMAGE TO FLORA 02 ☒ OBSERVED (DATE 1986) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

No growth at landfill.

01 ☐ K. DAMAGE TO FAUNA 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION (INCLUDE ADDRESS OF LOCATION)01 ☐ L. CONTAMINATION OF FOOD CHAIN 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION01 ☐ M. UNSTABLE CONTAINMENT OF WASTES 02 ☒ OBSERVED (DATE 1970) ☐ POTENTIAL ☐ ALLEGED
(Specify Release: Spilling, Leaking, Emission, etc.)
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

Area used for the disposal of arsenic acid residues and alleged drum disposal.

01 ☐ N. DAMAGE TO OFFSITE PROPERTY 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Arsenic acid residues entered Piles Creek with the flowing of tides.

01 ☐ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION01 ☐ P. ILLEGAL/UNAUTHORIZED DUMPING 02 ☒ OBSERVED (DATE 1970) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Arsenic acid residues over flowed to this area from special sewer area

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL OR ALLEGED HAZARDS

III. TOTAL POPULATION POTENTIALLY AFFECTED: _____

IV. COMMENTS

V. SOURCES OF INFORMATION (List sources: Personnel, etc. - State the source and the results)



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

L IDENTIFICATION
01 STATE 02 SITE NUMBER

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 <input type="checkbox"/> A. GROUNDWATER CONTAMINATION 03 POPULATION POTENTIALLY AFFECTED: _____	02 <input type="checkbox"/> OBSERVED (DATE: _____) 04 NARRATIVE DESCRIPTION	<input type="checkbox"/> POTENTIAL	<input type="checkbox"/> ALLEGED
01 <input type="checkbox"/> B. SURFACE WATER CONTAMINATION 03 POPULATION POTENTIALLY AFFECTED: _____	02 <input type="checkbox"/> OBSERVED (DATE: _____) 04 NARRATIVE DESCRIPTION	<input type="checkbox"/> POTENTIAL	<input type="checkbox"/> ALLEGED
01 <input type="checkbox"/> C. CONTAMINATION OF AIR 03 POPULATION POTENTIALLY AFFECTED: _____	02 <input type="checkbox"/> OBSERVED (DATE: _____) 04 NARRATIVE DESCRIPTION	<input type="checkbox"/> POTENTIAL	<input type="checkbox"/> ALLEGED
01 <input type="checkbox"/> D. FIRE/EXPLOSIVE CONDITIONS 03 POPULATION POTENTIALLY AFFECTED: _____	02 <input type="checkbox"/> OBSERVED (DATE: _____) 04 NARRATIVE DESCRIPTION	<input type="checkbox"/> POTENTIAL	<input type="checkbox"/> ALLEGED
01 <input type="checkbox"/> E. DIRECT CONTACT 03 POPULATION POTENTIALLY AFFECTED: _____	02 <input type="checkbox"/> OBSERVED (DATE: _____) 04 NARRATIVE DESCRIPTION	<input type="checkbox"/> POTENTIAL	<input type="checkbox"/> ALLEGED
01 <input type="checkbox"/> F. CONTAMINATION OF SOIL 03 AREA POTENTIALLY AFFECTED: _____ <i>(Area)</i>	02 <input type="checkbox"/> OBSERVED (DATE: _____) 04 NARRATIVE DESCRIPTION	<input type="checkbox"/> POTENTIAL	<input type="checkbox"/> ALLEGED
01 <input type="checkbox"/> G. DRINKING WATER CONTAMINATION 03 POPULATION POTENTIALLY AFFECTED: _____	02 <input type="checkbox"/> OBSERVED (DATE: _____) 04 NARRATIVE DESCRIPTION	<input type="checkbox"/> POTENTIAL	<input type="checkbox"/> ALLEGED
01 <input type="checkbox"/> H. WORKER EXPOSURE/INJURY 03 WORKERS POTENTIALLY AFFECTED: _____	02 <input type="checkbox"/> OBSERVED (DATE: _____) 04 NARRATIVE DESCRIPTION	<input type="checkbox"/> POTENTIAL	<input type="checkbox"/> ALLEGED
01 <input type="checkbox"/> I. POPULATION EXPOSURE/INJURY 03 POPULATION POTENTIALLY AFFECTED: _____	02 <input type="checkbox"/> OBSERVED (DATE: _____) 04 NARRATIVE DESCRIPTION	<input type="checkbox"/> POTENTIAL	<input type="checkbox"/> ALLEGED

SOLID WASTE MGMT. UNIT IWMF Industrial Waste LOCATION _____

Management Facility

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

1 IDENTIFICATION

01 STATE _____

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ☒ A. GROUNDWATER CONTAMINATION02 ☒ OBSERVED (DATE: _____)☐ POTENTIAL ☒ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

Area is alleged to have received arsenic acids, mercury compounds and from sludges open ditch system before Plant was built ground water contamination possible

01 ☒ B. SURFACE WATER CONTAMINATION02 ☒ OBSERVED (DATE: 1977-79-81)☐ POTENTIAL ☒ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

IWMF has exceeded discharge limits on these occasions and has been sited by EPA and NJDEP/DWR

01 ☐ C. CONTAMINATION OF AIR02 ☐ OBSERVED (DATE: _____)☐ POTENTIAL ☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

01 ☐ D. FIRE/EXPLOSIVE CONDITIONS02 ☐ OBSERVED (DATE: _____)☐ POTENTIAL ☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

01 ☐ E. DIRECT CONTACT02 ☐ OBSERVED (DATE: _____)☐ POTENTIAL ☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

01 ☐ F. CONTAMINATION OF SOIL02 ☐ OBSERVED (DATE: _____)☐ POTENTIAL ☐ ALLEGED

03 AREA POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

01 ☐ G. DRINKING WATER CONTAMINATION02 ☐ OBSERVED (DATE: _____)☐ POTENTIAL ☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

01 ☐ H. WORKER EXPOSURE/INJURY02 ☐ OBSERVED (DATE: _____)☐ POTENTIAL ☐ ALLEGED

03 WORKERS POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

01 ☐ I. POPULATION EXPOSURE/INJURY02 ☐ OBSERVED (DATE: _____)☐ POTENTIAL ☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

L IDENTIFICATION
01 STATE 02 SITE NUMBER

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ☐ A. GROUNDWATER CONTAMINATION02 ☐ OBSERVED (DATE: _____)☐ POTENTIAL☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

Discharge of arsenic acid wastes from area head sewer line and burned drums observed in this area lead to concern of groundwater.

01 ☐ B. SURFACE WATER CONTAMINATION02 ☐ OBSERVED (DATE: _____)☐ POTENTIAL☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

Arsenic acid discharged to this area overflowed to area affected by Piles Creek.

01 ☐ C. CONTAMINATION OF AIR02 ☐ OBSERVED (DATE: _____)☐ POTENTIAL☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

01 ☐ D. FIRE/EXPLOSIVE CONDITIONS02 ☐ OBSERVED (DATE: _____)☐ POTENTIAL☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

01 ☐ E. DIRECT CONTACT02 ☐ OBSERVED (DATE: _____)☐ POTENTIAL☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

01 ☐ F. CONTAMINATION OF SOIL02 ☐ OBSERVED (DATE: _____)☐ POTENTIAL☐ ALLEGED

03 AREA POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

Dumping of arsenic acids and iron sludges. Also drum now stored in area possible source of soil contamination.

01 ☐ G. DRINKING WATER CONTAMINATION02 ☐ OBSERVED (DATE: _____)☐ POTENTIAL☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

01 ☐ H. WORKER EXPOSURE/INJURY02 ☐ OBSERVED (DATE: _____)☐ POTENTIAL☐ ALLEGED

03 WORKERS POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

01 ☐ I. POPULATION EXPOSURE/INJURY02 ☐ OBSERVED (DATE: _____)☐ POTENTIAL☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

SOLID WASTE MANAGEMENT UNIT	LOCATION	SUBSTANCE NAME	TYPE	PHYSICAL STATE	CHARACTERISTICS	QUANTITY	CONCENTRATION
I IWMF	N-9	Phenol arsenic	Metal	Liquid, solid	Toxic		
A	J-8	Phenol arsenic cyanide Dichlorobenzene Trichlorobenzene Bis (Chloromethyl ether)	Metals VO's Basic Neutrals Acid compounds	Liquid Solid			
	I-4	arsenic, Phenol	Metals				
	B	arsenic, Phenol Mercury					
N-9	B	Arsenic, Phenol, Mercury					

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SWMU LEGEND:

A= Landfill

B= Surface Impoundment

C= Waste Pile

D= Land Treatment

E= Injection Well

F= Incinerator

G.1= Tank, Above Ground

G.2= Tank, Underground

H= Container Storage Unit

I= Other

SOURCES OF INFORMATION:

I. Conclusions and Recommendations

Facility: GAF Linden

A. Conclusions:

- 01 Identify units which have had the potential for releases.
- 02 Identify units which have had observed releases.

B. Recommendations:

- 01 Should this facility be required to perform an RI/FS?

(yes/no) YES

More data needed. Specify.

The above conclusions and recommendations are accepted for purposes of the completion of RCRA facility assessment requirements.

Signed:

Date

R. Gervasio
BSA Preparer

2-9-87

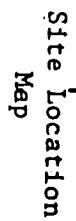
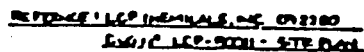
DHWM-BHWE

DHWM-BHWP

DWR

Melinda Powers, Sect Chief 8-3-87
DHWM-BCM

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Shaded Areas
Demised
Premises
+/- 2.102 Acres

101374

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MEMO

DEPARTMENT OF E.

NMENTAL PROTECTION

TO Scott SantoraFROM Walter OlenickDATE 1/13/82SUBJECT GAF - Linden

As we discussed, I am submitting data regarding toxic contamination at the subject company site with a brief discussion outlining the contaminants which were discharged.

1. The Special Sewer area highlighted in red was used for the discharge of arsenic acid residues from Building #46. The line went overhead approximately 300' over a trestle over the railroad tracks and was discharged in the low lying marsh area. This overflowed to the other red highlighted area to the west. The westerly area was inundated by the tidal flow flowing Piles Creek and toxic materials flowed back and forth with the tides (a sort of reflux action).

Arsenic acid residues result from the amination (using ammonia) of sulfonated anthraquinones in the presence of arsenic acid under pressure in an autoclave. On completion of the amination, pressure is reduced by blowing off unreacted ammonia (which is condensed and recycled to subsequent batches), followed by dilution with water and filtration of the product. Spent arsenic acid in the filtrate were discharged via the Special Sewer line to the Special Sewer Area.

If process details of this reaction procedure are required, this can be made available from U.S. Government Printing Office documentation obtained in post World War II process studies conducted by several teams at the I.G. Farben plants in Germany. GAF formerly was owned by I.G. Farben.

In addition to arsenic wastes, iron sludges were also directed to the Special Sewer Area via the Special Sewer line.

2. Among products manufactured in Building #49, were the alpha sulfonated anthraquinones. See report of December 21, 1970 for details regarding this operation.

Discharge of acidic solutions was by means of sewer lines which discharged beneath the building. The building was constructed on pilings over an area filled with cinders from their coal burning facilities. Included in this waste discharge, was the diluted sulfuric acid residues from the alpha sulfonated anthraquinones, which contained mercuric sulfate and traces of entrained metallic mercury. The acidic solutions drained through the cinder fill and was discharged via drainage ditch to Tract #9. It is estimated conservatively that over 2.5 million pounds of mercury and mercury compounds were discharged to ultimately become incorporated in sludges in the Arthur Kill. Building #49 has since been demolished.

3. During an inspection period in 1970, drums of highly chlorinated hydrocarbon compounds from still residues were buried in the green highlighted area of the plot plan. The residues were from the manufacture of pre-emergence herbicides.
4. I am enclosing a copy of documentation regarding mercury pollution dated December 21, 1970. Although it had been forwarded to the Water Resources group on January 11, 1971. (See memo of H. Wortreich and later to Marty Sanvito on December 12, 1976, and even more recently copies went to Water Resources in 1979 - no action appears to have been taken.

Is it possible to obtain mining rights?

Walter Olenick
Walter Olenick
Supervisor

101376

Dy

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MW5

18 ground surface

MW4
10.1 ground surface

FILL

3.8 MSL

MOIST → DRY ORGANIC
CLAY/SILTY SANDWET → MOIST
GRAY SAND8.72
Below SLDRY RED BROWN
ORGANIC CLAYMOIST GRAY-SILTY
CLAYDRY STIFF
RED BROWN
CLAY - PEBBLES26.2
Below SL28.72
Below SLPREPARED BY: JILL MONROE, NUDEP
SOURCE: WELL LOGS - SHIMMEL

RFA

The GAF Corporation plant in Linden has been in operation under various owners and operations since the early 1900's. The facility began as a German owned Film and analine manufacturer and was taken over by the United States Justice Department in 1941 and was operated by the U.S. Government until 1966. The plant has been operated by what is now GAF from 1966 until the present.

The plant at its peak manufactured five- hundred finished products which were derived from using four-hundred raw materials in process and storage. The principal product catagories are surfactants, dye stuffs, industrial chemicals and metal specialty products.

The facility is bordered on the east by the Arthur Kill, on the west by the Central Railroad and the New Jersey Turnpike. Piles Creek and Dupont Co. are adjacent at the northern border. Sinclair Refinning and the Linden-Roselle Sewage Authority are the southern border.

The plant is located in the tidal wetlands associated with the Arthur Kill and the nearby Rahway River. The natural and man made surface waters of the site all flow to the plants waste water treatment system (built in 1978) via an open, unlined drainage ditch system.

The facility is constructed on fill of variable thickness. Boring logs indicate this fill to be underlain by tidal marsh, glacial till deposits consisting of layers and lenses of silt, sand and clay. Bedrock occurs about twenty feet below the surface. Water bearing zones would be found in the fill and in the more permeable sections of the till material. The Brunswick Formation is used as an aquifer for industrial cooling by facilities in the area.

GAF has withdrawn their RCRA Part B application. They no longer intend to store hazardous waste for longer than a 90 day period. The plants permitted hazardous waste container (SOL) storage facility (Building #53) is in the closure process at this time and has been cleared of all contaminanted materials. A new, short term storage site (Building 207) is being made ready to receive containerized hazardous waste. The drains in the building have been plugged and door ways have been diked to contain spills. GAF is waiting approval from NJDEP to begin using this new storage space.

A system of unlined earthen drainage channels up to 6 ft. wide in places, through out the facility is used to collect any surface water run-off, wastewater from the chemical process areas, spilled material and the facility raw sewage and send it to the facilities Water Treatment Plant.

Building #49 (demolished) was part of this open ditch system. Among the products manufactured in building #46 were the Alpha Sulfonated Anthraquinones. This building was constructed on pilings over an area filled with cinders from the GAF coal burning facility. Included in the waste discharge from building #49 was diluted Sulfuric Acid residues from the Alpha Sulfonated Anthraquinones which contained mercuric sulfate and traces of entrained metallic mercury. The acidic solution drained through the cinder fill and discharged via open ditches to tract #9 which is now the site of the Industrial Waste Management Facility (IWMF). It is estimated that 2.5 million pounds of mercury and mercury compounds were discharged to ultimately become incorporated in sludges in the Arthur Kill. The Sulfonated Anthraquinones also produced arsenic acid residues as a result of amination of the Sulfonated Anthraquinones in the presence of arsenic acid under pressure. Spent arsenic acid was discharged from Building #49 and deposited in tract #9 via the open drainage ditch.

When work was suspended in Building #49, Building #46 housed the Alpha Sulfonated Anthraquinone manufacturing process. The arsenic acid residue was discharged from this building via a special overhead sewer line. This line ran 300 ft. over a trestle over the railroad tracks and discharged in the low marsh area (site of drum landfill) west of Building #120 adjacent Piles Creek. This area was inundated by the tidal affected Piles Creek and toxic materials flowed back and forth with the tides. In addition to arsenic wastes, iron sludges were also directed to the special sewer area west of Building #46 via the special overhead sewer line.

GAF operated two landfills on site. The larger one "Old Landfill" is located in the southwest portion of the property and is 10-12 acres in size. This landfill was operated from 1964 to 1971 by GAF. It is also possible this area was used by both the U.S. Government and the German manufacture (I.G. Farben) for chemical waste disposal. GAF admits to disposing of chemical wastes and drummed materials, along with building rubble and industrial trash at the Old Landfill. During an inspection in 1970 drums of highly chlorinated hydrocarbon compounds from still residues were detected buried in the Old Landfill. These residues were from the manufacture of pre-emergent herbicides.

In 1975 four concrete standpipes (14" dia) were installed on the Old Landfill to recover oil floating on the water. The only layer is periodically pumped out drummed and disposed of off site. Analysis results from 1982 show the only layer to be high in phenols, mercury and chlorinated hydrocarbons. Depth to water in the standpipes indicates that they penetrate only the landfill material. No perforations are visible on the walls of the pipes. Perforated pipe is considered proper installation with this type well.

A second landfill was on site from 1970 to 1973. This drum landfill is located north of the Old Landfill in the low marsh area west of Building #120. The same area as the arsenic acid disposal over flow.

This area was also proposed as a demolition fill site by GAF and Linden. This area was once a tributary of Piles Creek which borders the site on the north. The creek has been dammed off at Dupont Rd. The area now contains a large volume of standing water, also buried drums and leachate seeps were observed on various inspections.

Seven monitoring wells are in place ground both landfills. Sample analysis results from 1983 show high levels of volatile organics, phenolics and metals contamination. These wells are 2"-diameter PVC. Four wells GAF 1, 4, 5 and 6 are screened in the surficial fill with top of their well screens above the groundwater table. The remaining three wells GAF 2, 3 and 7 are screened in the underlying aquitarad and could be serving as a conduit for flow from the surficial fill. Eleven wells have been proposed by DEP, but not installed at this time.

Since 1977 GAF has operated an Industrial Waste Management Facility (IWMF) on site.

The IWMF is located in the southeastern portion of the facility in the area of Tract #9, the arsenic and mercury disposed site.

The IWMF is made up of the following units:

1. Oil Water Skimmer- to remove waste oil floating on top of wastewater stream before the wastewater enters the IWMF.
2. Lagoon Storage Tank- 6,000 gallon Fiberglass Tank used to store skimmed waste oil. The tank is located on a concrete pad and is surrounded by a concrete dike. On inspection the diked area was found to contain 1 inch of dark oily liquid. The tank styrofoam cover has a large crack. GAF contends the lagoon oil stored in this tank is non hazardous 70% nonylphenol and 19% fatty acids. BHWPC informed GAF that classification of lagoon oil would require additional testing. In any case it is manifested to the Delaware Container Co. of Pennsylvania and burned.
3. Aeration lagoons - 3 large 200' x 300' synthetic membrane lined.
4. Clarifiers- 3 waste water clarifiers-

In Jan. 1979 a concrete wall in the equalization basin of the IWMF collapsed. The basin was primarily used to dampen acid wastes before being neutralized.

In March 1979 the Interstate Sanitary Commission cited GAF for excessive levels of phenols, arsenic acid and high concentrations of chlorinated hydrocarbons in the wastewater discharge.

A non-compliance report was drafted in June '79 changing that the NPDES discharge limit for phenols and arsenic acid had been exceeded.

Sept. 1979 the GAF IWMF was cited for violation of the NPDES permit due to discharge of heavy foam to the Arthur Kill.

June 1986 GAF and NJDEP entered into an ACO requiring GAF to meet the

Tetrahydrofuran (THF) is manufactured at this plant. As a result of the manufacture of this product, a residue accumulates in the process reactor when the material is synthesized and also after distillation a residue accumulates in the distillation unit. When a sufficient quantity of residue is accumulated it is removed directly from these units and sent off site to a licensed/permitted T/S/D Facility. The THF area has a concrete base and a 3 ft. concrete dike surround the area. On inspection the diked area was found to contain 1-2 inches of dark oily liquid.

GAF was included in the 1983 Phase I dioxin study by NJDEP the results of this sampling proved to be inconclusive, due to background interference in May 1985 the facility was included in the EPA National Dioxin Study. Soil and sediment samples were taken, with no detectable dioxin levels in the soils. Sediment results were not available.

Enforcement Actions and Incidents:

June 1973- The state issues a Notice of Intent to deny renewed of the GAF registration to landfill on site.

June 1981- GAF failed to use or complete the required forms of New Jersey to dispose of waste oil by private disposal service.

April 1969- A private investigator was called on site due to plant workers being over come by noxious fumes.

March 1979- An explosion occurred in Building #46 and a fire broke out. Suspected cause, a reaction of sulfuric and nitric acids. One half the building is completely demolished.

Nov. 1982- Storage tank containing oleum (approx. 500 gals.) ruptured. The spilled material was diluted with water and allowed to flow to the drainage ditches.

Nov. 1982- A final order by EPA Reg II issued for improper handling and disposal of PCB's at GAF.

RECOMMENDATIONS

GAF through their consultant Aware Inc. has presented NJDEP/DWR with a Supplemental Information and Compliance Plan concerning the renewal of NJPDES permit no. 0000019.

Drainage Ditches- Ground water Quality Management evaluate the impact of ditches on area ground water quality. Sampling of ditch sludges parameters to include dioxin. Upgrade or remove ditches from service.

1. GAF has historically been involved in the manufacture of dioxin precursors and dioxin forming compounds. NJDEP Phase I study proved inconclusive and the EPA results are incomplete. Further dioxin sampling is needed at GAF. Both landfills, special sewer areas, Tract #9, Buildings #46, #36 and area where Building #49 once stood should be sampled.
2. Further investigate the mercury disposal area. Initiate soil sampling in the area. Parameters to include Priority Pollutants and Dioxin.
3. GAF should resample lagoon oil for it to be classified as non-hazardous.

Expedite approval of Building 207 as the hazardous waste container storage site.

Up grade monitoring well system at the site.

On Oct. 1986 inspection at GAF by Bureau of Site Assessment observed empty drums, stained ground construction materials and construction debris in the arsenic acid disposal site east of the "Old Landfill". This area should be inspected by Solid Waste as a possible land fill site.

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PAGINATION PURPOSES**

GAF CHEMICALS CORPORATION
FOOT OF SOUTH WOOD AVENUE
LINDEN, UNION COUNTY, NEW JERSEY
EPA ID # NJD002185973

GENERAL INFORMATION AND SITE HISTORY

The GAF Chemicals Corporation (GAF) operates a 125-acre chemical manufacturing facility located on South Wood Avenue, Block 587, Lots 1 and 2.1 in the City of Linden, Union County, New Jersey. The site lies in an industrial area on the western bank of the Arthur Kill. The site is bordered to the northwest by DuPont's Grasselli Plant, to the southwest by BP Oil and to the south by LCP Chemicals and Plastics, Inc. and Northville Industries. Undeveloped wetlands associated with Piles Creek lie to the north. The New Jersey Turnpike borders on the west. Tremley and Linden residential areas begin 0.3 mile west of GAF. Carteret residential areas are 1.4 miles south. Residents of New York's Staten Island lie 1.2 miles southeast.

Grasselli Chemicals Company began operations in this general area of Linden in 1885, although the portion of the former Grasselli property, which is now owned by GAF, was not utilized for chemical manufacturing until approximately 1919. It became Grasselli Dyestuff Company and was subsequently incorporated in 1929 as American I.G. Chemical Corporation, which was owned by I.G. Farbenindustrie A.G., a German company. The U.S. company's name was changed in 1939 to General Aniline and Film Corporation. In 1942, 98% of the company stock was seized by the United States Justice Department as a war asset and the facility was operated by the U.S. Government as Alien Property Custodian until 1965, when the U.S. Government sold the stock to the public in a public offering. On April 24, 1968, General Aniline and Film Corporation changed its name to GAF Corporation. In 1986, GAF Chemicals Corporation was incorporated, and all of the assets of the former Chemicals Division of GAF Corporation were transferred to GAF Chemicals Corporation.

SITE OPERATIONS OF CONCERN

The product categories that have been manufactured at the site include surfactants, dyestuffs, pigments, industrial chemicals, and metal speciality products. The following general categories of compounds were the primary products manufactured by the various operators of the facility during the time frames specified:

PRODUCTION COMMENCED

1919
1935
1940
1941

1945

1955
1957
1958

MATERIALS PRODUCED

Dyestuffs
Igepons (Surfactants)
Igepals (Surfactants)
Carbonyl Iron Powders
(Iron Pentacarbonyl)
Reppe Chemistry Pilot
Plant
Caustic Chlorine
Ethylene Oxide
Phosphate Ester
Surfactants

PRODUCTION CEASED

1974
Still in production
Still in production
Late 1940s

1957

1971
1971
Still in production

1962	Agricultural Herbicides, Amino Type Compounds including Amiben	1977
1963	Low Foamers (Surfactants)	Still in production
1964	Polyclar (Polyvinyl pyrrolidone, food grade beer clarifier)	1968
1965	Gantrez Half Esters	1969
1966	Ganex	Still in production
1970	Gafquat 755	Still in production
1975	Propoxylations (Propylene Oxide Surfactants)	Still in production
1976	Tetrahydrofuran	Still in production

Currently, only tetrahydrofuran, surfactants, Gafquat 755 and Ganex are manufactured by GAF at the site. GAF plans to phase out production of surfactants by March 1991. The production will be moved to their plants in Georgia and South Carolina.

Past chemical manufacturing operations at the site generated numerous solid and liquid wastes including, but not limited to:

- a. Phenol
- b. Arsenic wastes including arsenic acid
- c. Mercury compounds (entrained metallic mercury in dilute sulfuric acid solution, mercuric sulfate)
- d. Chlorinated hydrocarbon compounds from still residues
- e. Amiben and other amino type agricultural herbicides

Present manufacturing operations at the site generate phenol wastes, spent caustic, tetrahydrofuran bottoms and wastewater from cleaning process equipment.

A 10 to 12 acre landfill, sometimes referred to as the "Old Landfill", is located in the southwest portion of the facility. This landfill was operated from the early 1930s until 1970 by the various owners responsible for the facility during that time period. In 1981, GAF submitted a Comprehensive Environmental Response, Compensation and Liability Act (hereinafter "CERCLA") Section 103(c) Notification of Hazardous Waste Site document, and on May 22, 1985, GAF submitted a RCRA and HSWA Solid Waste Management Unit Information document, which described the materials disposed in the Old Landfill. GAF and the various other owners deposited dry and liquid chemical wastes (organics, inorganics, solvents, heavy metals, acids), drummed materials, bulk liquids, phenolic oils, laboratory wastes, off-specification products, still residues, solid wastes and industrial trash in this landfill. GAF alleges that the "Old Landfill" was operated in accordance with applicable law at the time of its operation.

GAF's final NJPDES Discharge to Surface Water Permit (No. NJ0000019) became effective March 1, 1986. The draft Discharge to Groundwater, dating back to November 25, 1987, has not been issued final at the time of this writing.

GAF has had various spills and releases which will be discussed in the following sections.

GROUNDWATER ROUTE

Bedrock under the GAF facility is the Brunswick Formation, soft highly fractured hematite stained red shales with some interbedded sandstones. The top 8 to 18 feet of the Brunswick Formation is considered residual soil, or weathered bedrock and can be described as clayey silt. Above this lies a layer of glacial deposits ranging between 9 and 23 feet in thickness, attributed to ground moraine. Above the glacial material lie tidal marsh deposits. The bottom 1.5 to 6 feet consists of organic silt and clay. This material grades into 1.5 to 10 feet of dark brown fibrous peat deposits containing minor amounts of sand and black organic silt and clay. The site has been reclaimed from tidal marshes by the placement of 5 to 10 feet of fill. The fill consists of soil, industrial materials and demolition debris.

Generally, the fill material acts as a surficial water bearing zone above the less permeable tidal marsh deposits and glacial till. The Brunswick Formation also acts as a semi-confined aquifer under these clays and silts. The GAF facility is located within a tidally influenced groundwater discharge area, which flows towards the Arthur Kill and Piles Creek.

At present, GAF has 12 4 inch diameter monitoring wells installed in 1983, 4 standpipes installed in the center of the landfill in 1975, 32 well points and 13 surface gages. The wells monitor a variety of depths. GAF proposes to install additional shallow and deep 2 inch diameter wells in accordance with an Administrative Consent Order (ACO) signed June 16, 1989. See site map for locations.

Groundwater in the vicinity of GAF is not used for potable purposes due to brackish conditions and chemical contamination. The nearest potable well, lying approximately 3.3 miles to the northwest, is operated by the Elizabethtown Water Company. It draws from the Brunswick Formation at a depth of 348 feet. The City of Rahway has a potable well approximately 4 miles west of GAF, drawing from the Brunswick Formation at 269 feet. There are no potable water intakes considered threatened by GAF.

GAF obtains water for industrial use from the Arthur Kill and from Elizabethtown Water Company. The nearest industrial well is operated approximately 2.6 miles north of GAF. It draws from the Brunswick Formation at a depth of 570 feet.

Groundwater sampling was conducted at GAF on November 29, 1988 by the NJDEP, Division of Hazardous Waste Management (DHWM), Bureau of Planning and Assessment (BPA). Sampling results, which are discussed below, revealed acetone, naphthalene, 1,2-dichloropropane, 1,2-dichlorobenzene, 4-chloraniline, acenaphthene, phenanthrene and bis (2-ethylhexyl) phthalate. There are, however, no groundwater uses in the immediate vicinity. Groundwater discharges to the adjacent surface water bodies, Arthur Kill and Piles Creek.

A draft NJPDES - Discharge to Groundwater permit was issued to GAF on September 16, 1985 and again on November 25, 1987. At the time of this writing, a new draft is being prepared.

SURFACE WATER ROUTE

GAF is bordered to the north by Piles Creek and to the east by the Arthur Kill. The portion of GAF containing the Waste Water Treatment Plant lies near the bank of the Arthur Kill. To the north of the Waste Water Treatment Plant, DuPont's Graselli Works separates GAF from the Arthur Kill by approximately 1200 feet. Piles Creek flows to within 100 feet of GAF by the Drum Landfill area, but is otherwise isolated by hundreds of feet of undeveloped swampland.

GAF uses an unlined ditch system to collect and transmit wastewater for disposal from the various buildings and chemical process areas throughout the site. This network of unlined topographical depressions and channels receives chemical process water, cooling water and sanitary wastewaters. The ditch system also captures surface runoff and leachate seeping from the landfills. Prior to 1977, wastewater in the ditches discharged to nearby surface water bodies, including Piles Creek and the Arthur Kill. In 1977, GAF constructed the Waste Water Treatment Plant which has since received the wastewaters. The connection to Piles Creek was dammed off in 1966.

GAF's consultant, Eckenfelder Inc., states in their Remedial Investigation Work Plan of December 1989 that runoff from approximately 82 acres entered the ditch system. Runoff on the remaining 43 acres, therefore, infiltrates to groundwater or flows untreated to surrounding surface water bodies.

A sample was collected from the drainage ditch during the November 29, 1988 sampling episode conducted by the NJDEP, DHWM, BPA. Bis (2-ethylhexyl) phthalate, arsenic and manganese were detected in the sample. Sampling results are discussed below.

The surface water downstream from GAF has no potable uses due to salinity and chemical contamination. The Arthur Kill is used as a channel for large freight ships and for recreational boating, fishing and crabbing.

The only wetland within 2 miles is Pralls Island, located 800 feet across the Arthur Kill in New York territory. The Peregrine Falcon, a federally endangered species, is known to hunt in the salt marshes near GAF. Untreated runoff from a portion of GAF's property has the potential to transport contaminants off site to surrounding surface water bodies.

GAF is permitted to discharge to the Arthur Kill from their Waste Water Treatment Plant according to a NJPDES - Discharge to Surface Water Permit No. NJ0000019. The permit went into effect on March 1, 1986 and is due to expire on January 31, 1991. Tests for Acute Toxicity in GAF's discharge revealed GAF's discharge consistently failed to meet the minimum acute toxicity permit limitation of $LC50 > 20\%$ (by volume). The resultant Administrative Consent Order, signed June 1, 1989, requires GAF to upgrade their Waste Water Treatment Plant in order to meet their effluent limitations by March 4, 1991. GAF is in the process of complying with the ACO requirements.

AIR ROUTE

GAF has 38 active air permits and 23 recently expired temporary permits.

In April 1969, a private investigator was called on site due to plant workers being overcome by noxious fumes. Releases and Enforcement violations are listed as follows:

8/78 Order to Cease Violation (visible smoke emitted from Boiler #1)
3/31/81 Notice of Violation (visible air emissions)
8/25/87 Notice of Violation (boiler stack exceeded emission capacity)
11/6/87 (40 lbs. of Ethylene oxide released)
7/20/88 (35 lbs. of Ethylene oxide released)
11/17/88 (Scrubber failure caused release of 165 lbs HCL and 260 lbs SO2)
1/4/89 (Tetrahydrofuran vapor release from 2000 lb. spill)

There is a continued potential for release at GAF via volatilization from the open ditch system.

SOIL

The GAF facility is placed on up to 10 feet of fill material which overlies the native marsh deposits. Some of this fill material may have been contaminated prior to emplacement.

Hazardous Waste Management practices over the past 100 years at GAF has lead to widespread contamination. GAF continues to discharge industrial and sanitary wastes to open ditches and impoundments under the buildings.

Soils and sediments were sampled by the NJDEP, DHWM, BPA on December 1, 1988. Numerous volatile organics, semi-volatiles and metals were detected in the samples. Sampling results are discussed below.

Prior to 1978, GAF produced a bacteriostatic/fungistatic agent (Preventol-I) containing 2,4,5-trichlorophenol (2,4,5-TCP) which is classified as a Class I dioxin precursor by the USEPA. Two samples of Preventol - I were tested on June 17, 1983 for 2,3,7,8-tetrachlorodibenzo dioxin (2,3,7,8-TCDD) and were found to contain 0.62 and 0.65 ppb.

On June 23, 1983, ERM-Northeast collected six samples (from ditch sediments, production building floors and in a production tank) for 2,3,7,8-TCDD analysis. Analysis by ETC indicated no presence of 2,3,7,8-TCDD with detection limits ranging from 0.02 to 0.51 ppb. Two of the samples, however, had no surrogate recovery, indicating possible matrix interference. All sediment samples were composited.

On July 11, 1985 USEPA personnel collected 34 composite samples from the area where Preventol was manufactured. Nineteen of the samples were of surficial soils; eight were collected from ditch sediments; and the remaining seven were QA/QC samples including replicates and blanks. None of the nineteen soil samples showed the presence of 2,3,7,8-TCDD above the detection limits. Seven of the eight sediment samples showed positive detection of 2,3,7,8-TCDD at levels ranging from 0.0036 to 0.0263 ppb. The standard action level for 2,3,7,8-TCDD in soils and sediments is 1 ppb.

On December 1, 1988, the NJDEP/DHWM/BPA collected ten on-site soil/sediment samples for 2,3,7,8-TCDD analysis from the impoundments and ditches associated with production Buildings 36, 46, 52 and 204. The laboratory

reported all samples as non-detected for 2,3,7,8-TCDD with detection limits for maximum possible concentrations ranging from 0.022 to 0.25 ppb. A QA/QC review however, rejected the data because the Performance Evaluation sample, reported as containing 3.25 ppb 2,3,7,8-TCDD was actually a soil blank containing no 2,3,7,8-TCDD.

The Remedial Investigation, required by the Administrative Consent Order of June 16, 1989, will include limited sampling for 2,3,7,8-TCDD. Table 3 is a compilation of 2,3,7,8-TCDD analyses.

DIRECT CONTACT

In April 1969, a private investigator was called on site due to plant workers being overcome by noxious fumes. No other reported incidents of direct contact were found in the file review. There is still potential for direct contact by employees via the open ditch system. The ditch system continues to transmit untreated wastewater and landfill leachate through the site.

The nearest offsite population, in the Tremley section of Linden, is approximately 0.3 mile west of GAF. The site is surrounded by an 8 foot chain link fence and barbed wire and has a 24 hour security guard at the entrance gate.

FIRE AND EXPLOSION

GAF reports the following fires and explosions:

<u>DATE</u>	<u>LOCATION</u>	<u>NATURE OF EVENT</u>
1959-1960	Building 36	Fire
December 1965	Building 204E	Explosion (Propargyl Bromide)
Circa 1974	Building 3	Fire
October 1974	Building 46	Explosion and Fire (Nitration Reactor)
March 1979	Building 46	Explosion (Nitration Reactor)

There is a continuing potential for fires or explosions at GAF due to the materials handled, including ethylene oxide. Ignition sources are restricted on site.

ADDITIONAL CONSIDERATIONS

There is evidence of vegetative stress at GAF. Much of the land does not support plant growth. While there are no reports of damage to fauna, there is potential due to the presence of contamination in the soil and surface water on site. Before 1977, GAF discharged wastewaters directly to the Arthur Kill. Bioaccumulative compounds, including mercury, may have damaged fauna and contaminated the food chain. Off-site property may have been damaged via runoff carrying contaminants to adjacent surface water bodies.

ENFORCEMENT ACTIONS

NJDEP Enforcement Actions are summarized below:

DATE ISSUED	NATURE OF VIOLATION	DISPOSITION	NATURE OF NOTICE
AUGUST 1978	EMITTING VISIBLE SMOKE FROM BOILER #1	COMPLIED-NO PENALTY	ORDER TO CEASE VIOLATION
MARCH 31, 1981	VISIBLE AIR EMISSIONS	WARNING-NO PENALTY OR ACTION REQUIRED	NOTICE OF VIOLATION
MAY 29, 1984	RCRA DEFICIENCIES BASED ON AUGUST 11, 1983 INSPECTION	DEFICIENCIES CORRECTED- \$2,000 PENALTY PAID	ADMINISTRATIVE ORDER
OCTOBER 13, 1985	RCRA WASTE STORAGE DEFICIENCIES	CORRECTIVE ACTION TAKEN \$6,300 PENALTY PAID	NOTICE OF VIOLATION
JUNE 4, 1987	OPERATING EQUIPMENT WITHOUT A PERMIT	PERMIT OBTAINED- \$4,400 PENALTY PAID	NOTICE OF VIOLATION
AUGUST 25, 1987	BOILER STACK EXCEEDED EMISSION CAPACITY	\$100 PENALTY PAID	NOTICE OF VIOLATION
NOVEMBER 17, 1988	SO ₂ HCL RELEASE DUE TO EQUIPMENT FAILURE - FAILURE TO REPORT	\$2,000 PENALTY PAID \$4,000 PENALTY PAID \$1,000 PENALTY PAID	NOTICE OF VIOLATION
JUNE 7, 1989	WWTP BIOASSAY LC ₅₀ LIMITATION	\$308,000 PENALTY PAID	VOLUNTARY ADMINISTRATIVE CONSENT ORDER
JUNE 19, 1989	SITE REMEDIATION	\$7.5 MILLION IN LETTER OF CREDIT	VOLUNTARY ADMINISTRATIVE CONSENT ORDER

SUMMARY OF SAMPLING DATA

1. Sampling date: January 25, 1983
Sampled by: ERM - Northeast
Plainview, New York
Samples: Seven monitor wells (2 inch diameter)
Laboratory: ETC (#12257)
Edison, New Jersey
Parameters: Volatile organics, base/neutral compounds,
acid compounds, metals, cyanide and phenol.
Sample description: Seven on site monitoring wells:

	<u>DEPTH (feet)</u>	<u>SCREEN INTERVAL (feet)</u>
W-1	10	0-10
* W-2	20	12-20
* W-3	18	13-18
W-4	10	0-10
W-5	12	0-12
W-6	9.5	0-9.5
* W-7	28	23-28

*(W-2, 3 and 7 will be removed, properly sealed and replaced by shallower wells. The existing borings penetrate the peat and clay layers and may act as conduits for vertical migration of contaminants).

Contaminants detected: Elevated levels of benzene, halogenated benzene compounds, naphthalene, phenol, arsenic and cyanide were detected in monitoring wells W-4, 5, 6 and 7.

No contaminants were detected in W-2 and W-3.
Contaminants detected are summarized below:

(ppb)

	<u>W-1</u>	<u>W-4</u>	<u>W-5</u>	<u>W-6</u>	<u>W-7</u>
Benzene	38	584	127	319	87
Chlorobenzene	ND	15,200	958	538	319
1,2-Dichloroethane	ND	52	ND	ND	41
Ethyl benzene	33	27	13	BMDL	ND
Toluene	69	96	BMDL	BMDL	BMDL
Phenol	BMDL	5,800	BMDL	BMDL	BMDL
1,2-Dichlorobenzene	ND	907	343	111	108
1,3-Dichlorobenzene	ND	490	148	28	14
1,4-Dichlorobenzene	ND	497	233	34	23
Naphthalene	203	114	36	26	BMDL
1,2,4-Trichlorobenzene	ND	83	132	17	BMDL
Arsenic	ND	8.6	360	110	BMDL

ND = Not detected

BMDL = Below method detection limit

QA/QC:

No QA/QC information other than method detection limits were provided.

File location:

NJDEP/DHWM/BPA
Trenton, New Jersey

2. Sampling date:

November 29, 1988

Sampled by:

NJDEP/DHWM/BPA
Trenton, New Jersey

Samples:

One sample from the drainage ditch north of the Waste Water Treatment Plant, bordering DuPont's Grasselli Plant. Ten groundwater samples.

Laboratory:

Roy F. Weston, Inc.
Lionville, Pennsylvania

Parameters:

Target Compound List plus 30 peaks

Sample description:

One sample from the drainage ditch north of the Waste Water Treatment Plant. Ten onsite monitoring wells described as follows:

	<u>DEPTH (feet)</u>	<u>SCREEN INTERVAL (feet)</u>
GAF-7S	9	2-9
7D	44	34-44
9S	12.5	2.5-12.5
9D	63	53-63
10S	9	2-9
10D	61	51-61
13S	10	3-10
13D	51	41-51
14S	9	2-9
14D	44	34-44

Contaminants detected:

In the drainage ditch sample, bis(2-ethyl hexyl) phthalate at 12 ppb, arsenic at 72.2 ppb and manganese at 1280 ppb were detected. Bis(2-ethyl hexyl) phthalate was detected in all the wells. Metals detected are summarized in Table 1. Organic contaminants detected are summarized below:

(ppb)

	<u>7S</u>	<u>7D</u>	<u>9S</u>	<u>9D</u>	<u>10S</u>	<u>10D</u>	<u>13S</u>	<u>13D</u>	<u>14S</u>	<u>14D</u>
ACETONE	ND	420	ND	ND	ND	2400	ND	ND	ND	ND
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND	31	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	6	ND	ND	ND	ND	ND	ND
NAPHTHALENE	ND	ND	18	ND	ND	ND	ND	ND	ND	NL
4-CHLOROANILINE	83	ND	ND	ND	ND	ND	ND	ND	ND	ND
ACENAPHTHENE	ND	ND	12	ND	ND	ND	ND	ND	ND	ND
PHENATHRENE	ND	ND	21	ND	ND	ND	ND	ND	ND	ND
BIS(2-ETHYLHEXYL) PHTHALATE	3	5	1	17	2	460	26	3200	500	7

ND = Not detected

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QA/QC:

A QA/QC review of the data by the NJDEP, Division of Hazardous Site Mitigation (DHSM), Bureau of Environmental Measurements and Quality Assurance (BEMQA) stated that:

- o base/neutral results for the drainage ditch sample were rejected.
- o base/neutral acid extractable results were rejected for MW-14S.
- o holding times for the pesticide/PCB extraction were exceeded.
- o selenium results for all samples were rejected due to blank contamination.
- o low levels of various metals were found in the field blank; however, levels in the samples were five times greater than in the field blank.
- o percent recoveries of antimony, chromium and silver were high, thus qualifying, "J", the values.
- o lead and selenium results are qualified, "J", due to low sample spike recovery.

File location:

NJDEP/DHWM/BPA
Trenton, New Jersey

3. Sampling date:

December 1, 1988

Sampled by:

NJDEP, DHWM, BPA
Trenton, New Jersey

Samples:

25 soil/sediment samples

Laboratory:

Envirodyne Engineering Inc.
St. Louis, Missouri

Parameters:

Target Compound List plus 30 peaks, dioxin.

Sample description:

Soil and sediment samples were collected throughout various portions of the site.

Contaminants detected:

Numerous metals above NJDEP action levels have been detected on site. Sediment 3 had the greatest number and highest concentrations of volatile organics. Sediments 2 and 11 had the most semi-volatile compounds with Sediment 2 having the highest concentrations. No pesticides or PCBs were detected in the samples. Contaminants detected are summarized in Table 2. Dioxin results are summarized in Table 3.

QA/QC:

A complete QA/QC review was conducted by the NJDEP, DHSM, BEMQA. Findings included:

- o Samples Sed-1, Sed-4, Sed-6, Sed-8, Sed-10, Sed-11, Sed-12, Sed-13, Sed-15 and Soil-6D were all rejected for volatile organics due to holding times being exceeded. All additional samples were qualified as "J" due to holding times between 10 and 15 days.

o Samples Soil-2, Soil-3, Soil-9D, Soil 10, Sed-10 and Sed-11 were rejected due to exceeded holding times of base/neutral acid extractables.

o Field blank results for base/neutral acid extractables were rejected due to the method blank being outside control limits.

o The laboratory incorrectly reported not detected for the pesticide/PCB analysis, however, Aroclor-1260 in Sed-11 and Aroclor-1254 in Sed-9 were detected at concentrations of 190,000 ppb and 130,000 ppb, respectively.

File location:

NJDEP/DHWM/BPA
Trenton, New Jersey

TABLE 1

11/29/88

INORGANIC ANALYSIS SUMMARY GAP, Linden

LABORATORY: WESTON-LIONVILLE

CONCENTRATION (Units UG/L)

ANALYTE	78	7D	98	9D	108	10D	13S	13D	14S	14D	
Aluminum	160	B 7390	69.8	B 715	94.9	B 1840	23500	573	13800	514	Alu
Antimony	34.6	U 89.0	34.6	U 44.5	34.6	U 34.6	66.8	34.6	100	40.8	B Ant
Arsenic	6.6	B 7.6	10.7	U 1.2	20.0	U 12.0	26.0	12.0	150	12.0	U Ars
Barium	65.5	B 356	232	B 62.3	468	B 113	354	455	2530	53.0	B Bar
Beryllium	0.10	U 2.6	0.10	U 2.6	0.10	U 3.5	6.1	1.7	3.2	2.6	B Ber
Cadmium	2.2	U 2.2	2.2	U 2.2	2.2	U 2.2	6.7	2.2	3.8	2.2	U Cad
Calcium	162000	764000	37900	1800000	36500	1870000	201000	975000	737000	1440000	Cal
Chromium	3.0	U 11.0	6.4	B 3.0	3.0	U 3.0	104	3.0	54.2	3.0	U Chr
Cobalt	4.6	B 5.6	3.3	U 3.3	3.3	U 3.3	1150	3.3	190	7.1	B Cob
Copper	48.2	41.0	25.7	51.3	15.0	B 56.3	123	48.8	188	61.0	Cop
Iron	851	41300	8130	16100	15100	18400	433000	1220	224000	84300	Iro
Lead	1.3	B 13.4	3.9	B 3.9	2.0	B 7.4	52.8	1.3	1160	2.0	B Lea
Magnesium	31100	337000	19400	600000	35900	516000	118000	167000	486000	518000	Mag
Manganese	712	2440	112	1070	196	2080	141000	375	157000	8060	Man
Mercury	1.6	0.44	0.20	U 4.1	0.20	U 0.20	0.22	0.20	10.1	0.20	U Her
Nickel	58.9	23.0	16.3	B 8.9	6.3	B 9.6	527	8.5	107	28.5	B Nic
Potassium	5800	14000	13400	26200	36800	24600	18100	488000	55900	29800	Pot
Selenium	1.9	B 0.90	2.7	B 1.8	1.1	B 1.0	2.3	1.9	2.7	9.0	U
Silver	5.1	U 5.1	6.8	B 5.1	5.1	U 5.1	21.0	5.1	16.3	5.1	U
Sodium	95800	619000	309000	3000000	476000	2260000	814000	2310000	3140000	3390000	Sod
Thallium	36.0	B 36.0	23.0	U 4.6	2.3	U 48.0	36.0	44.0	48.0	36.0	B Tha
Vanadium	4.8	B 32.6	68.3	7.5	4.8	B 4.8	254	4.8	95.5	18.0	B Van
Zinc	120	82.5	46.4	42.6	16.1	B 42.3	979	35.4	380	93.8	Zin
Cyanide	10.0	U 10.0	10.0	U 10.0	10.0	U 10.0	10.0	10.0	12.6	10.0	U Cya

The following extracted samples required dilution because they contained high levels of target compounds:

Well#	Dilution Factor
10D	10
13D	50
14S	10

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TABLE 2-11

SUMMARY OF ALL SITE BUILDINGS

GAF Chemicals Corporation, Linden Plant

Building No.	Time Period	Activities
1	1929 \pm 1952	Production
3	1929 \pm 1976	Cooperage - Warehouse
5	1921 \pm 1978	Carpenter Shop
6	1920 \pm	Mason Shop
7	1920 \pm	Rigger Shop
8	1921 \pm 1976	Warehouse
9	1920 \pm 1976	Paint Shop - Lead Shop
13	1940*	Power House
18	1929 \pm 1976	Firehouse - Safety Equipment
20		Pipe Shop
22		Production
23		Production
24		Production
25		Production
26		Production
27		Production
28		Production
29	1929*	Garage
31	1915 \pm 1978	Laboratory and Offices
33		Laboratory Store Room
34	1941 \pm	Naphthaline Storage
35	1921 \pm 1984	Offices, later Warehouse - Pipe Shop
36	1921*	Production
40		
41A	1942 \pm	
41B	1965*	THF Still
42	1942 \pm	Soda Ash Storage
43	1944 \pm	Metal Storage
44	1925 \pm 1976	Water Meters
45	*	Chill Brine House - Refrigeration Equipment
46	1926 1986*	Production
47	1927*	Engineering Department and Maintenance Shops
48	1934*	Warehouse/Laboratory
49	1934 \pm 1976	Production
50	1927 \pm 1982	Production
51	1929 \pm 1982	Laboratory and Offices
52	1927*	Production
53	1937*	Production (1937-1974) Waste Storage (1974-1986)
56		Oil House

B4

TABLE 2-11 (continued)
SUMMARY OF ALL SITE BUILDINGS
GAF Chemicals Corporation, Linden Plant

Building No.	Time Period	Activities
63	*	Oil Pumping Station
66	*	Coal Silos
100	1939/40*	Administration Building
101	1929*	Showers and Lockers
110	*	Cooling Water Pumps
120	1956*	Warehouse
200/201	1941 ±	Ammonia Storage and Filling Station
200	1940*	Production
201	1940 ± 1976	Storage
202	1947 ± 1976	Acetylene Generation
203	1941 ± 1976	Offices and Laboratory
204	1946*	Pilot Plant/Semi-Works Production
205	1916 ± 1929	Storage
207	1970*	Pilot Plant/Engineering Offices Laboratory and later Silver Recovery
300	*	Ethylene Oxide Area/Administration
301		Service Building
302		Utilities
303		Reaction Building
304		Compressor Control
305		Distillation Building
306	*	Refrigeration Building
308		Substation
309		Storage
350	*	Machinery Building
400	*	Electrical Control
402	*	Pump Station
410	*	Filter Press & Control

Note:

*Building still in existence, either wholly or in part

TABLE 2-12

BUILDINGS CONTAINING SIGNIFICANT HAZARDOUS MATERIALS

GAF Chemicals Corporation, Linden Plant

BUILDING 3AB:

Activity: Drums and barrels used for intermediate and semi-finished dyestuffs and pigments were washed in this building for reuse. Residue from products manufactured in Buildings 46, 49, 50 and 52 were rinsed from these containers.

BUILDING 13:

Activity: Powerhouse. This unit has burned various production byproducts including nonene, nonane, di-nonyl phenol bottoms, ethanol, and ortho nitro toluene as a supplement to the No. 6 fuel oil.

BUILDING 24:

Activity: Produced sulfur colors and nitrobenzene, dinitrobenzene, nitrotoluene and dinitrotoluene.

Raw Materials: Inorganic acids and bases, non-metallic elements and several hydrocarbons.

BUILDING 36:

Activity: Produced sulfur colors, bacteriacide/fungicide, beta oxy naphthoic acid and numerous surface active agents.

Raw Materials: Inorganic acids including sulfuric and nitric, and inorganic bases including caustic chloride. Various organics including ethylene oxide, nonene, phenol, alkyl phenol, di-isobutylene, sodium oxethane, disobutyl phenol, chlorobenzene, 2,4,5 trichlorophenol, amines, various alcohols, non-metallic elements, and several acid chlorides.

Byproducts: Organic solvents, caustic solutions, poly alkyl phenols, fatty acid residues, and nonyl phenol.

BUILDING 46:

Activity: Produced dye intermediates

Raw Materials: Inorganic acids and bases, various metallic catalysts, and numerous other organic salts purchased or produced in 49 Building, and numerous hydrocarbon solvents.

Byproducts: Sodium sulfide, dinitrobenzene isomers, iron oxide sludge, dichlorobenzoyl chloride still bottoms, arsenic acid, and ammonia.

TABLE 2-12 (continued)

BUILDINGS CONTAINING SIGNIFICANT HAZARDOUS MATERIALS

GAF Chemicals Corporation, Linden Plant

BUILDING 48, Dept. 600:

Activity: Produced color formers for the former Binghamton photo products plant.

Raw Materials: Inorganic acids including chlorosulfonic acid, inorganic bases, organic solvents, including methyl hexanone, xylene, THF, toluene, naphthalene, nitrobenzene, benzene, heptane, chloro-nitrobenzene, acetone, pyridine and ethylene dichloride, as well as mercury, diethylamine, and anhydrous ammonia.

Byproducts: Acetic acid, organic solvents and mercury compounds.

BUILDING 49:

Activity: Produced dye intermediates.

Raw Materials: Inorganic acids and bases, various metallic catalysts including mercury, numerous other salts purchased or manufactured in 46 Building, and various organics, including chlorobenzene, nitrobenzene, and anthraquinone.

Byproducts: Organic solvents, dilute sulfuric acid, benzoic acid, arsenic medicuric sulfate, metallic mercury, polychlorobenzoyl chlorides, polychloronitro benzenes, iron sludges, and lime cakes.

BUILDINGS 50, 52, AND 53:

Activity: Produced dyestuffs and pigments. Building 50 was used primarily for simple acid pasting; Building 52 was used for dyestuff and pigment production using intermediates from 46 and 49 Buildings and for pigment production using urea and phthalic anhydride. Building 53 was used for physical conditioning of products from Buildings 50 and 52.

Raw Materials: Dye intermediates produced in Buildings 46 and 49; inorganic acids including chlorosulfonic and sulfonic, inorganic bases, various chlorinated solvents including nitrobenzene, dichlorobenzene, trichlorobenzene, naphthalene, metallic and non-metallic elements, including sulfuryl chloride, cuprous chloride, and aluminum chloride.

Byproducts: Ammonia, organic solvents, sodium sulfites, m-amino benzene sulfonate, sodium acetate, ethylene glycol iron cake, and tars.

TABLE 2-12 (continued)

BUILDINGS CONTAINING SIGNIFICANT HAZARDOUS MATERIALS

GAF Chemicals Corporation, Linden Plant

BUILDING 120:

Activities: Surfactant materials of all kinds, i.e., Igepals, non-ionic surfactants, Alipals, phosphate esters, and low foamers are drummed and stored in this building.

BUILDING 200:

Activity: Produced carbonyl iron powder.

Raw Materials: Sponge iron, hydrogen, carbon monoxide and coke

BUILDING 204:

Activity: Initially a pilot facility used to produce acetylenic products from formaldehyde and acetylene. Later use of the building was for semi-works production of color formers for the former Binghamton photo products plant.

Raw Materials: Inorganic acids and bases, organic solvents including alcohols, heptane and benzene, as well as purchased organic salts were used in this production. Pilot batches of surfactants were made using ethylene oxide, various alcohols, and other organic salts and hydrocarbons.

Byproducts: Organic solvents and acetic acid.

BUILDING 207:

Activity: Used for silver recovery from the film operation, originally a research facility for the Chemical Engineering group in 1970.

Raw Materials: Scrap film, caustic and organic salt

ETHYLENE OXIDE AREA (BUILDINGS 303, 304, 305, 306)

Activity: Produced ethylene oxide.

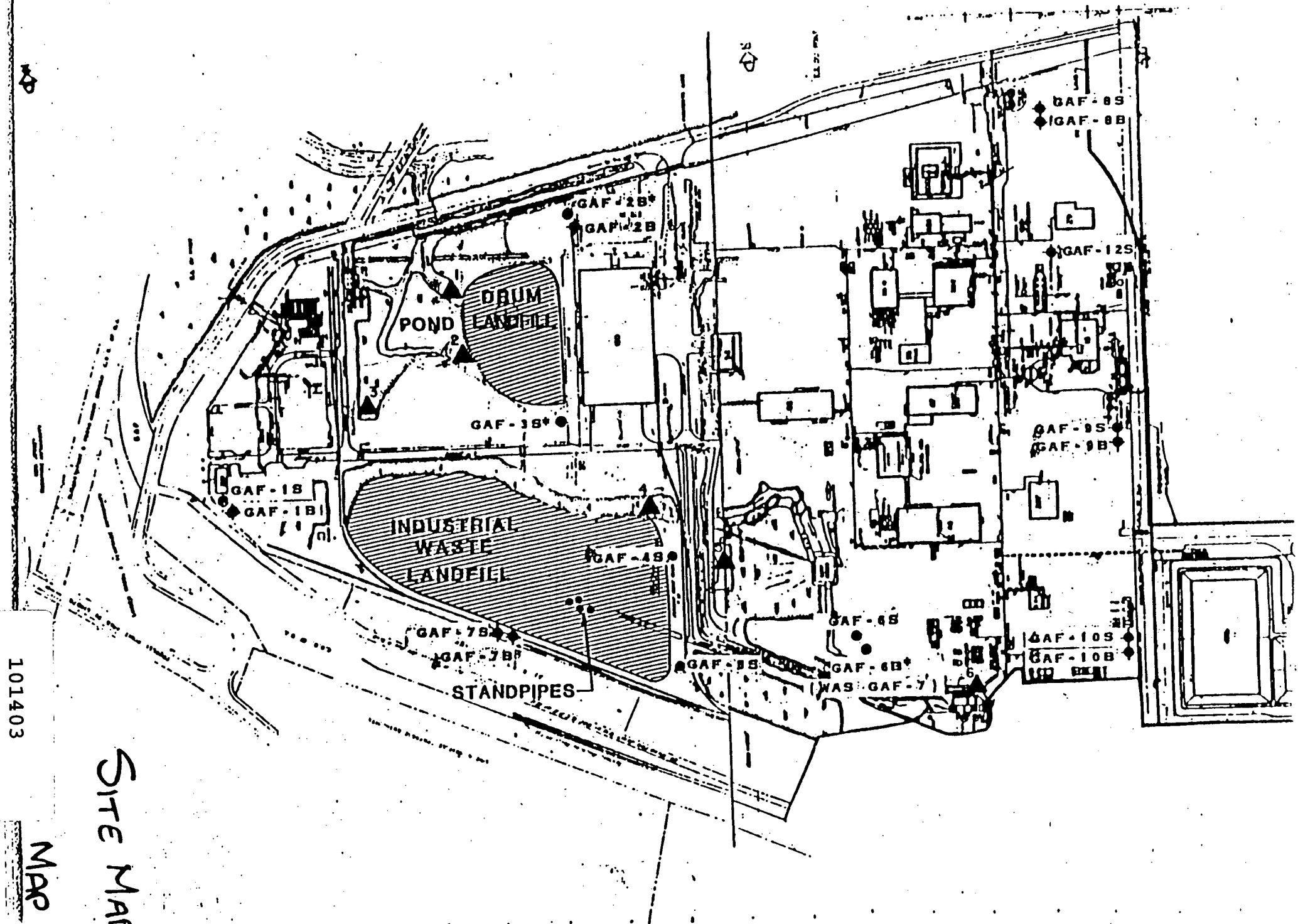
Raw Materials: Ethylene gas, platinum and silver catalyst.

Byproducts: Glycols

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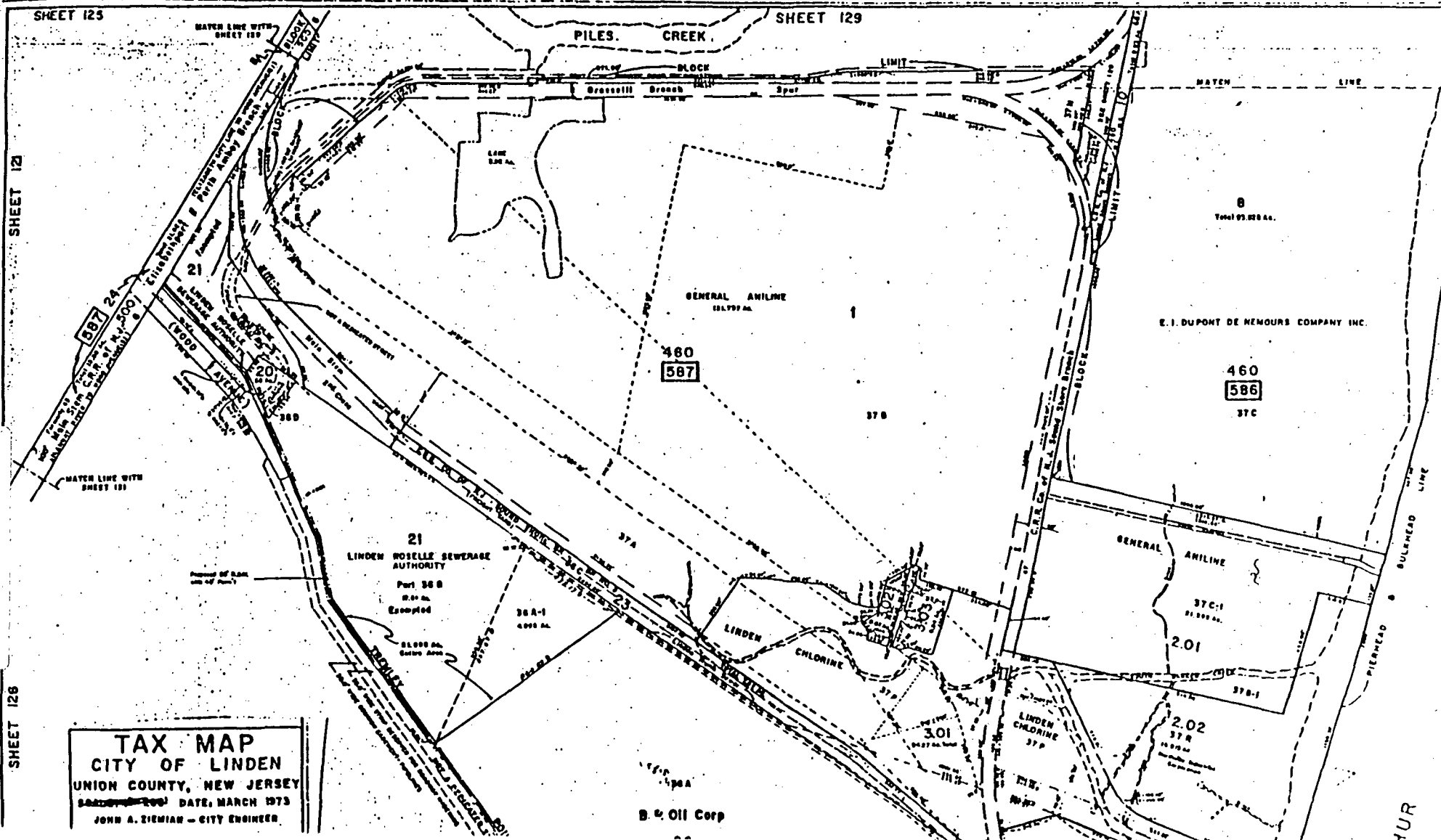
MAP

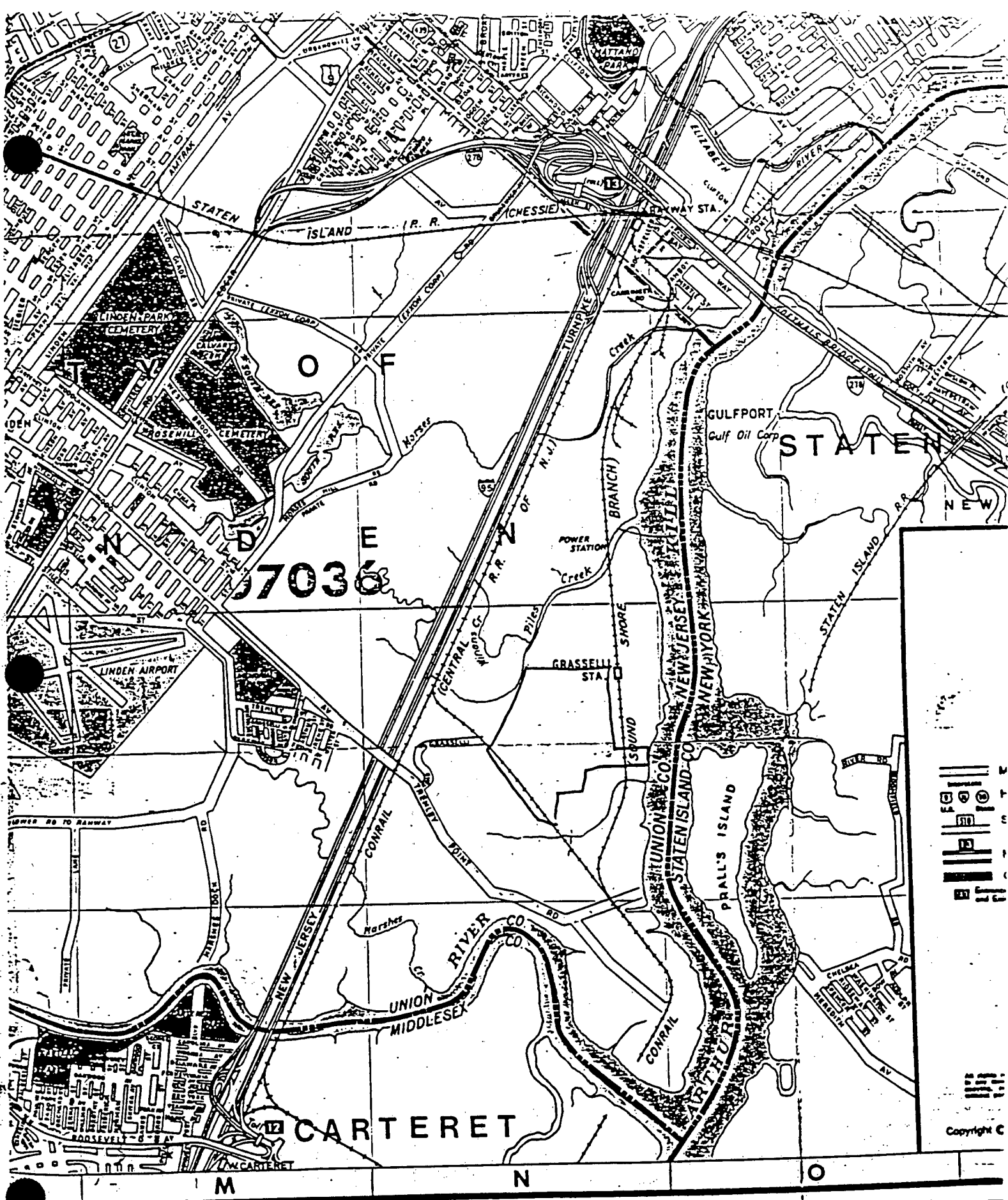
SITE MAP



101404

MAF





UNION COUNTY ROAD MAP
MAP 4

101405

TABLE 2-13

RAW MATERIALS USED IN MANUFACTURING
PROCESSING —1988

GAF Chemicals Corporation, Linden Plant

Acetic AC GL Color Form	Decyl ALC	Isoamyl Alcohol
Acetic Anhydride PUR	Dibutyl 4 Cresol CP	Isobutyene
Acrolein Tech	Di-t-butyl Perox	Isodor P-4542
Acrylic Acid, Glacial	Dicyanid	Isophrone Di-isocyanate
Additive GLY	Diethanolamine	Isopropanol Cosmetic K
Alfol 6	Dieth Sulfate	Isopropanol
Alfol 810	Di-isobutylene	Isopropyl Alcohol, ANHY
Alfol 1012	Dimeth Ameth Methacrylate	Kathon C6 Preservative
Alfol 1218	Dimeth Am Eth Meth XLF	Latic Acid 88
Alfol 1620	Dimethylamine	Lauryl Alcohol Mixed
Amberlyst 15	Dinonyl Phenol Dist	Lauryl Alcohol Tech
Amberlyst XN-1010	Dodecyl Phenol	Lauryl Special
Am ETH Ethanolamine	Dow Corning 193 Surfactant	Maleic Anhy
Ammonia Anhy (CYL)	Emersol 132 Steric Acid	Methamine Anhy
Ammonia Anhy (H)	Emersol 153 Steric Acid	Methanol
Ammonia Anhy (1)	Epal 810	Micro Cell B
Amm Chloride Fine	Epal 1012	Micro Cell "C"
Amm Sulphate	Epal 1275	Micro Cell E
Antifoam B	Epon 828	Monoethanolamine
Antifoam C-PG	Ethanol SD-3A	Murac Anhy CYCLS
Antifoam Y 30	Ethylamine	Murac Anhy T/T
Benzene	Ethylen Glycol Meth Ether	Murac CP
Benzoyl Perox 70	Ethylene Glycol	Nekal BX-78 SOLN NOP
Benzyl Chloride	Ethylene Oxide	Nitrogen Dry
Boric Acid	Ethylene Oxide (CYL)	Nonene
Boron Trifluoride (CYL)	Formal 37K	Nonyl Phenol
Boron Trifluoride Ether	Gluteraldehyde 50% Aqua	Olefin Frac C-20 C-24
Butanol	Golpanol Boz	Oleic Acid
Butyl Cellosolve	Groco 55-1	Oleyl
T-Butyl Perox Pivalate	Heptane, Normal	Oleyl Alcohol Sub
Carbonyl Iron Powder HFF	1 Hexadecene	Oleyl Amin T
Castor oil	Hexane	Oleylamine Dist
Caustic Pot FLK	1-6 Hexanediol Diacrylat	Palmitic Acid
Caustic Pot Pellets	Hexyl ALC	Pe Triacrylane
Caustic Soda Beads	Hydrogen Perox 35	Phenol USP
Caustic Soda FLK	Hydrogen in Pipeline 1	Phenothiazine
Caustic Soda LIQ 25	2 Hydroxyethyl Acrylate	Phos AC 85
Caustic Soda LIQ 100	Hypophosphorous AC 50	Phos Oxy Chloride
CHL Acetate AC	Iodine FIN GRD CNS	Phos Pentoxide Mon
Citric Acid	Iodine Prill	Phos Trichloride
Coco Fatty AC C-108	Ionol Antioxidant	Poly Glycidol
Coco Fatty AC C-120	Irgacure 184	Poly Phos AC 115
Coconut Amine Dist	Irgacure 651	Propylene Oxide
Coconut Fat AC STR	Irganox 1010	Rock Salt (Solar)

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I. DOCUMENTS REVIEWED

DOCUMENT NAME	DATE	AUTHOR	LOCATION	NO. P.
1. Hazardous Waste Container Storage Facility closure plan	5-5-86	ERM/Northeast	65 Prospect St. Trenton	
2. Supplemental information/compliance Plan	12-15-55	A ware Inc.	"	
3. EPA/EPIC		EMSL LAS Vegas	"	
4. Hydrogeologic Investigation/ GAF Linden	4-15-83	ERM/NE	"	205
5. EPA Sampling Report		J. Dresky	"	
6. Reg II		Contrac Corp.	"	30
7. NJDEP Administration			"	
8. Consent Order NJDEP/DSW-DGW	6-13-86	NJDEP/DWR	"	18
9. NJ0000017				
10. NJDEP response to comments from Awar-submitted/Draft Permit NJ 0000017	2-25-86	A. Schiffman NJDEP/	"	1
11. GAF response 3004(u) RCRA Amendments	5-26-85	Grier Andres Grier Attorneys GAF	"	
12. RCRA Permits A&D Permits GAF		Santo Guillerma GAF	401 E. State St Trenton	
13. Memo from W. Olmick	1-13-82	W. Olmick	65 Prospect Trenton	5
14. Letter to EPA	2-19-82	F. Inzarrilo	"	
15.				

II. OFFICES CONTACTED

OFFICE	CONTACT NAME	CONTACT TELE. NO.	CONTACT DATE
1. NJDEP/CSWB	R. Patel		
2. NJDEP/DWR	R. Casper		
3. NJDEP/DWR	J. Schinifser		
4.			
5.			
6.			
7.			
8.			
9.			
10.			

101408

I. Conclusions and Recommendations

Facility: _____

A. Conclusions:

01 Identify units which have had the potential for releases.

02 Identify units which have had observed releases.

B. Recommendations:

01 Should this facility be required to perform an RI/FS?

(yes/no) _____

More data needed. Specify.

The above conclusions and recommendations are accepted for purposes of the completion of RCRA facility assessment requirements.

Signed:

Date

BSA Preparer

DHWM-BHWE

DHWM-BHWP

DWR

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WASTE LAGOON
GROUND-WATER MONITORING
LCP CHEMICALS, NEW JERSEY, INC.
LINDEN, NEW JERSEY

February 1982

Geraghty & Miller, Inc.
Consulting Ground-Water Geologists and Hydrologists
North Shore Atrium
6800 Jericho Turnpike
Syosset, New York 11791

ATTACHED

B

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Purpose and Scope.	5
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Water and Soils Chemistry.	10
REFERENCES.	14

APPENDICES

- A. Monitoring Well Boring Logs and Construction Data
- B. Analytical Protocol for Mercury in Water and Soils
- C. Administrative Consent Order of August 31, 1981 by State of New Jersey Department of Environmental Protection to Linden Chemicals & Plastics, Inc.

FIGURE

	<u>Following Page</u>
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1. Permeabilities of Various Units Under the LCP Site.	8
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WASTE LAGOON
GROUND-WATER MONITORING
LCP CHEMICALS, NEW JERSEY, INC.
LINDEN, NEW JERSEY

INTRODUCTION

LCP Chemicals, New Jersey, Inc. (LCP) retained Geraghty & Miller, Inc. to conduct ground-water monitoring at a waste disposal site at their Linden, New Jersey, plant. The plant produces chlorine by the electrolytic decomposition of brine using metallic mercury as an electrode. Mercury concentrations in the process wastes are high enough so that the wastes are hazardous as defined in the Resource Conservation and Recovery Act (RCRA) of 1976.

In order to comply with both the RCRA monitoring well requirements and a consent agreement with the State of New Jersey, LCP installed monitoring wells at its waste facility. This facility consists of an active brine sludge lagoon and a small, experimental lagoon used for pilot studies of the Chem-fix process for waste stabilization.

SUMMARY OF FINDINGS AND CONCLUSIONS


1. Geologic data from soil borings and monitoring wells show that the study area is underlain by 30 to 50 feet of unconsolidated glacial till, organic sediments, peat, and artificial fill. These deposits are generally of low or moderately low permeability and rest on bedrock, the Brunswick shale member of the Triassic Newark Group.

2. The six monitoring wells installed near the LCP brine-sludge lagoon yielded ground-water samples with mercury levels below the U.S. Environmental Agency (USEPA) Primary Interim Drinking Water Standard of 0.002 mg/L (milligrams per litre).

3. Soil samples collected in the monitoring well borings, selected surface sites, and the South Branch Creek bed showed total mercury concentrations between 0.26 and 1,580 mg (milligrams) per kg (kilogram) of soil ppm (parts per million) as received.

4. Shallow, fill soils contained the most mercury (up to 1,580 ppm) while undisturbed, deeper soils had much lower concentrations (0.4 to 6 ppm). Intermediate concentrations (10 to 40 ppm) were found in organic sediments derived from marsh deposits taken at depths up to 17 feet below grade.

5. ~~Soil samples for mercury indicate ambient levels for this metal in undisturbed (uncontaminated), low permeability deposits up to approximately 5 ppm in this area.~~

ATTACHMENT 

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6. Higher levels of soils mercury, up to 40 ppm, indicate contamination by industrially derived fill materials, surface disposal of mercury compounds and/or selective fixation of mercury in organic sediments.

7. The difference between mercury levels in ground-water and soils samples arises because the soil components (silts, clays, and organic matter) tie up mercury through adsorption and complexation. Furthermore, many mercury compounds have low solubilities in water.

8. Water-level data do not reveal present leakage of water from the ~~brine~~ brine sludge lagoon via the subsurface.

9. Sources of mercury found in streambed sediments from South Branch Creek cannot be determined solely on the basis of soils or ground-water quality data. Potential sources, besides LCP's waste lagoon, may be atmospheric mercury "fallout," runoff, percolation through fill materials, and tide water from the Arthur Kill.

^
What about a release by LCP?

101415

ATTACHMENT B

RECOMMENDATIONS

1. LCP should maintain the monitoring wells in good condition for continued sampling as prescribed by RCRA. Care should be taken to avoid contamination of the wells.

2. Re-sampling and analysis of ground water (and soils, if necessary) should be performed according to the protocol currently in use (see Appendix B). All sampling procedures should be kept as constant as possible so that data from different sampling periods can be compared.

3. Water levels should be measured in each well prior to sampling using the "wetted tape" method. The date, time, tidal stage, weather conditions, and other pertinent data should be recorded along with each measurement.

4. If it becomes necessary to abandon any of the monitoring wells, closure must be performed by a licensed New Jersey water-well driller and in accord with state specifications.

ATTACHMENT B

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THE HYDROGEOLOGIC INVESTIGATIONPurpose and Scope

The New Jersey Department of Environmental Protection (NJDEP) administrative Consent Order of July 31, 1981 requires that LCP implement a monitoring program to evaluate the release of mercury and other metals to the ambient environment (see Appendix C). The monitoring program covers air, surface and ground water, and soils obtained from borings done on land and in the streambed. Geraghty & Miller, Inc., was retained to design and supervise the entire program except for the air monitoring studies, which were conducted by LCP.

The soil borings and monitoring well installations were made at five sites in the vicinity of the waste lagoons. Soils samples were described in detail with respect to lithologic and hydrologic characteristics and were retained for chemical analysis. Individual monitoring wells were screened in the most permeable soil materials penetrated at each boring site. Where more than one permeable zone was encountered, a multiple (cluster) well arrangement was used. Soil samples from four surface sites and a streambed site were also collected for mercury analysis. The soil boring, well construction and analytical procedures for water and soils chemistry followed USEPA procedures (see Appendix B) and were approved by NJDEP prior to field work.

Monitoring Well Installation

Six monitoring wells were installed between September 29 and October

ATTACHMENT B

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2, 1981 by H.P. Drilling of National Park, New Jersey, a licensed New Jersey well driller. Drilling permits were obtained for each well in accordance with New Jersey State law. Permit numbers are listed on each well log given in Appendix A.

The monitoring wells were drilled to consolidated bedrock which was encountered between 42.3 and 48.5 feet below grade at the sites shown in Figure 1. The drilling was done by cased borings (Wells 1, 1A, 2, and 3) and hollow-stem auger (Wells 4 and 5) with split-spoon core samples collected at 5-foot intervals or as directed. Water used during drilling was from an approved, potable water source. A sample of this water has been analyzed by LCP.

The monitoring wells are constructed of 1.5-inch diameter PVC pipe and have 30 to 50 feet of 1.5-inch diameter PVC screen; the screen length depended on the geologic deposits encountered. The screen was set in the drilled hole and packed with clean sand of suitable grade for the 0.020-inch screen slot opening. Bentonite seals were placed above and below the screen zone to prevent vertical flow in the drilled hole near the screen. The remaining open hole around the well casing was filled with cement grout. The top of each well is protected by a vented cap and steel stand-pipe which extends at least 1.5 feet above grade and is embedded in the cement grout. Well 5 was finished in a curb box because it was located in a high access area.

Sediment and water removed from the borings while drilling and from the finished monitoring wells were considered to be contaminated. There-

fore, they were deposited in the LCP waste lagoon.

After each monitoring well was completed, all temporary casings, tools, and equipment coming in contact with soils and water were cleaned with uncontaminated water to prevent cross-contamination.

Sampling Methods

Sediment and water samples collected throughout the investigation were delivered immediately after collection to the laboratory at LCP. Geraghty & Miller, Inc., and LCP have a list of samples collected, handled, and analyzed.

Sediment samples were collected while drilling with a split-spoon core barrel (2-inch outside diameter and 24 inches long) and placed in airtight, 8-ounce, clean, glass containers. Two sediment samples were collected from each spoon and are equally representative of the geologic deposits penetrated by the spoon. Water samples were collected from monitoring wells using a peristaltic pump after the wells were developed with a guzzler pump or bailer. Because the formation yield was typically very low, most wells were bailed dry and allowed to recover sufficiently to yield the required sample volume. For the few wells that could be pumped, at least ten times the volume of standing water in the well was removed before sampling as recommended by USEPA.

All tubing on the peristaltic pump was changed between samplings to prevent cross-contamination. Water samples were filtered immediately after collection by LCP laboratory personnel with a 0.45 micron (Millipore-type)

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filter and placed in a container, pre-treated with nitric acid to preserve the sample for metals analysis. Two quart-size water samples were collected from each well. Water samples were checked for temperature, pH, and specific conductance immediately after collection.

Hydrogeology

The site is located on Holocene and Pleistocene glacial deposits which thinly cover Triassic bedrock, the Brunswick Formation. The geology is typical of that recorded in eastern Union County by Nemickas (1976).

Unconsolidated geologic deposits in the study area can be separated in four distinct sedimentary units. From youngest to oldest, they are:

- Unit A - Miscellaneous fill deposits
- Unit B - Dark gray, organic clay
- Unit C - Well sorted sands intercalated with poorly sorted gravelly sands
- Unit D - Red-brown, tight silty clay, clay, and gravelly clay

The permeabilities of the four units varies because of differences in particle size, packing, and sorting. Observations of the split-spoon samples provide information on the relative permeabilities of these units (Table 1). A description of each unit follows.

Unit A is thin, but covers the study area continuously. It is a heterogeneous mixture of silt, sand, and gravel-sized particles with artificial components, such as slag, crushed stone, and brick. This fill layer varies in thickness from 4.5 feet near the tidal creek to 13.5 feet ungradient of the waste lagoon. The age, source and overall composition of this unit is unknown but was in place before LCP occupied the site. No informa-

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tion about the unit was available in records from the previous plant operator, GAF Corporation. Soil boring records from Hazen and Sawyer (1969) covering the general plant area show this unit to be extensive.

Due to the assortment of grain sizes and tight packing, permeabilities are relatively low. However, the base of the fill appears to be saturated. Well 1A was screened only at the base of the fill and top of Unit B, since this was recognized to be a thin, but semi-permeable zone.

Unit B is characterized by a dark gray clay with organic matter (tidal grasses) appearing throughout. Thin (2- to 12-inch) layers of brown peat are present near the top of this unit. Lenses of gray silt are also present but are generally thin and horizontally limited.

The organic clay is very cohesive and dry when examined in the sample spoons and did not yield significant water during drilling. This unit is present at all sites except five, where a dark gray, organic silty sand with pelecypods and gastropods, is found at the same horizon. This silty sand probably represents a tidal channel where water movement during the time of deposition was faster than in the rest of the area which was a tidal flat.

Unit C is present at well Sites 3, 4, and 5 and varies in thickness from 4.5 to 18 feet. This unit consists of well-sorted sand layers separated by poorly sorted gravelly sand layers. However, they are relatively thin, separated by tight, poorly sorted layers (where present) and are not present at all sites. It appears that this unit is of limited stratigraphic

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ic and lateral extent in this area.

Unit D is present at all sites and varies in thickness from about 14 to 29 feet. This unit is a till which is a heterogeneous mixture of particles deposited by a glacier. The upper part of this till unit is a silty clay or clayey silt with occasional occurrences of pebbles and cobble gravel. The middle horizons are composed predominantly of clay, with other sized particles present in trace amounts. The lower horizons above the bedrock surface are very coarse with cobbles and pebbles floating in a tight, clay matrix. The permeability of this unit is very low due to poor sorting of grain sizes, predominance of clay-sized particles, and tight packing of the individual grains. Wells screened in this unit yield water sparingly and recover very slowly after evacuation.

Bedrock was intercepted between 42.3 and 48.5 feet at the well sites. Clasts of Brunswick-type lithologies (siltstone and shale) were found in the coarse till above the bedrock surface.

Table 2 summarizes where each well has been screened with respect to geologic units present at the site.

Water and Soils Chemistry

Water samples bailed from each monitoring well were analyzed by LCP's laboratory for dissolved mercury according to approved procedures. Results are shown in Table 3. Water samples were also sent to Princeton Testing Laboratory to confirm the mercury analyses and to provide results for calcium, barium, and iron. These results appear in Table 4.

Table 1. Permeabilities of Various Units Under the LCP Site.

<u>Unit</u> ¹⁾	<u>Relative Permeability</u>	<u>Probable Range of K (feet per year)</u> ²⁾
A	Semi-permeable	0.1 - 100
B	Low-permeability	0.01 - 10
C	Well sorted sands -- permeable	500
	Poorly sorted sands -- semi-permeable	0.1 - 500
D	Low-permeability	0.01 - 1

1) Units are defined in the text.

2) From Sherard, et al. (1963).

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Table 2. Units in Which Wells are Screened.

<u>Well No.</u>	<u>Screen Zone</u>	<u>Units Screened In</u>
1	18.5 - 38.5	D
1A	5 - 10	Bottom of A/top of B
2	18 - 28	Top of D
3	15 - 30	Bottom of B, C, and top of D
4	18 - 38	C/top of D
5	8 - 38	Bottom of A, B, C, and D

Table 3. Dissolved Mercury Concentrations in Ground-Water Samples (concentrations in mg/L or ppm).

Well No.	Sampling Date	
	10-6-81	10-15-81
1	<0.0002	0.0006
1A	<0.0002	0.0009
2	<0.0002	<0.0002
3	<0.0002	<0.0002
4	<0.0002	<0.0002
5	<0.0002	<0.0002

Samples analyzed by the LCP Laboratory, Linden, New Jersey.

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Table 4. Results of Ground-Water Quality Analyses (concentrations in mg/L or ppm).

Well No.	Calcium	Barium	Iron	Mercury
1	1,100	3.5	5.9	< 0.001
1A	2,700	7.0	0.10	< 0.001
2	1,000	3.0	2.2	< 0.001
3	800	3.0	0.10	< 0.001
4	500	2.5	0.06	< 0.001
5	500	2.0	0.50	< 0.001

Note: Samples were received for analysis on November 25, 1981 at the Princeton Testing Laboratory, Princeton, New Jersey.

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Soil samples from monitoring well borings and from the land surface were analyzed by the LCP laboratory for total desorbable mercury content. Samples were leached according to USEPA protocol and filtered. The filtrate was then analyzed for mercury. The results of soils mercury analyses from borings are given in Table 5.

Surface soil samples and a tidal creek bed sample were collected on October 15, 1981 by hand, retained and analyzed for total mercury in the same way as the other soil samples. Locations of these sampling sites are shown on Figure 1 and analytical results are given in Table 6.

The results of water and soils mercury analysis shows (1) ~~surface~~ ~~soil contamination with mercury which decreases with depth,~~ and (2) ~~ground~~ ~~water which is essentially free of mercury.~~ Both results indicate little, if any, subsurface migration of mercury from the brine sludge lagoon. Subsurface soil types and calculated permeability values do not appear to allow significant fluid migration from the lagoon. Furthermore, the settled brine sludge itself has very low permeability.

Elevated mercury values in soils collected at depths to a maximum of 12 to 15 feet below grade are more difficult to interpret and might relate to the composition of the fill materials used to reclaim the present industrial site from its past, tidal marsh condition. Ground-water samples from this zone do not contain high levels of mercury, indicating that the metal is bound to the soil particles. In general, the soils penetrated in the well borings (silts and clays predominating) would be expected to trap mercury resulting in the low mercury levels found in ground water.

Table 5. Mercury Concentrations in Soil Boring Samples (depth in feet below grade; concentrations in ppm).

Sample	Depth	Mercury	Sample	Depth	Mercury
<u>Well 1</u>			<u>Well 2</u>		
1-1	0 - 2	225	2-1	0 - 2	68.1
1-2	5 - 7	17.4	2-2	5 - 7	2.1
1-3	10 - 12	1.72	2-3	10 - 12	1.0
1-4	15 - 17	1.3	2-4	15 - 17	0.32
1-5	20 - 22	1.04	2-5	20 - 22	0.91
1-6	25 - 27	0.89	2-6	25 - 27	0.26
1-7	30 - 32	2.81	2-7	30 - 32	0.34
1-8	35 - 37	1.74	2-8	35 - 37	0.34
1-9	40 - 42	0.82	2-9	40 - 42	0.79
<u>Well 3</u>			<u>Well 4</u>		
3- 1	0 - 2	101	4- 1	0 - 2	772
3- 2	5 - 7	528	4- 2	5 - 7	163
3- 3	10 - 12	9.12	4- 3	10 - 12	19.84
3- 4	15 - 17	0.68	4- 4	15 - 17	33.69
3- 5	20 - 22	1.00	4- 5	20 - 22	0.57
3- 6	25 - 27	0.40	4- 6	25 - 27	0.58
3- 7	30 - 32	1.18	4- 7	30 - 32	0.65
3- 8	35 - 37	0.48	4- 8	34 - 36	0.72
3- 9	40 - 42	0.85	4- 9	40 - 42	1.16
3-10	45 - 47	0.60	4-10	45 - 47	3.47
<u>Well 5</u>					
5- 1	0 - 2	35.71			
5- 2	5 - 7	33.39			
5- 3	10 - 12	37.02			
5- 4	15 - 17	1.99			
5- 5	20 - 22	5.73			
5- 6	25 - 27	0.83			
5- 7	30 - 32	5.28			
5- 8	35 - 37	0.42			
5- 9	40 - 42	0.60			
5-10	43.5 - 45.5	4.59			

Samples analyzed by the LCP Laboratory, Linden, New Jersey.

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Table 6. Mercury Concentrations in Surface Soil and
Tidal Creek Bed Samples (concentrations in ppm).

<u>Sample No.</u>	<u>Mercury</u>
S-1	558
S-2	27.45
S-3	1,070
S-4	1,580
Tidal Creek Bed	46.42

Samples analyzed by the LCP Laboratory, Linden, New Jersey.

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The meaning of the mercury levels found in soils at LCP is difficult to assess except in a relative sense. Natural mercury concentrations in rocks average from 0.01 to 20 ppm, with igneous rocks on the low end, and organic-rich sediments on the high end of this range (Wallace, et al., 1971). Higher concentrations may be found in areas of hydrothermal mineral deposition such as along major fault and orogenic belts. The mercury detected in soils beneath the study area most likely represent low solubility mercury compounds such as sulfides, phosphates or carbonates (Mortvedt, et al., 1972).

Pierce, et al. (1970) consider any mercury levels in soils exceeding 1 ppm, to be significant as evidence of mercury mineralization or surface contamination by mercuric wastes. Urbanized, industrial areas are known to have higher background levels of airborne mercury which is deposited on land by precipitation. Unfortunately, no published data on background levels of soil mercury in the Linden, New Jersey, area could be found.

The naturally occurring glacial tills penetrated by the monitoring well borings do not appear to show evidence of mercury contamination by human activities. Mercury levels above 1 ppm, especially near the bedrock contact may relate to ancient hydrothermal activity associated with tectonics and igneous intrusion of the Triassic sediments (Brunswick shale) underlying the site. Organic deposits, such as the peat, show high mercury levels (about 10 to 30 ppm) down to a maximum depth of 17 feet below land surface. These levels probably reflect the strong organic chelation of mercury derived from several possible sources: from surface contamination.

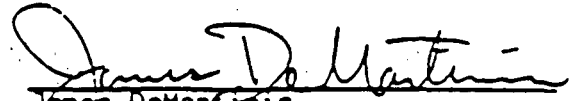
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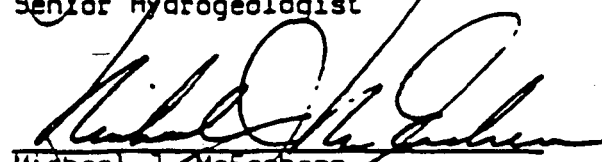
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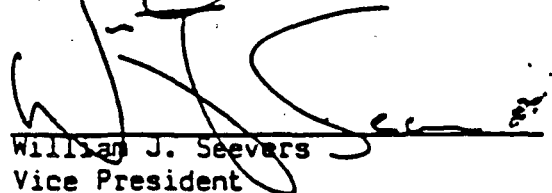
mercury wastes in the artificial fill, the decay of mercury containing minerals. and from mercury contained in atmospheric precipitation. Comparatively high mercury levels (up to 1,500 ppm) occurring in soils obtained at land surface are the likely result of present and/or prior land use.

Respectfully submitted,

GERAGHTY & MILLER, INC.


James DeMarcinis
Senior Hydrogeologist


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Vice President

February 11, 1982

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LCP CHEMICALS
FOOT OF SOUTH WOOD AVENUE
LINDEN, UNION COUNTY, NJ
EPA ID# NJD079303020

I. FACILITY OWNERSHIP/BACKGROUND INFORMATION

OWNERSHIP:

LCP Chemicals purchased the 26 acre chlorine production facility in 1972 from General Aniline and Film Corp. (GAF) who owned the facility since 1942. E.I. Dupont owned the land, which according to aerial photographs was coastal marshland, prior to GAF.

LCP leases two sections of their property. The Western section near the guard house, is leased by Union Carbide. They have been leasing the building and property since 1959 when the property was owned by GAF. The other leased section is Building 231. This building is leased by Microcell Technologies, Inc. They have leased the building since 1987. LCP also leased to Kuehne Chemical from 1974 to 1981, who operated in the area that is adjacent to Building 220 (presently a parking lot).

FACILITY OPERATIONS:

GAF began producing chlorine in 1961 by utilizing a "mercury cell electrolysis process". The process involved the electrolysis of a sodium chloride (brine) solution in the presence of metallic mercury. The residual mercury-sodium solution is then used to hydrolize water, forming sodium hydroxide and hydrogen gas. The metallic mercury was partially recovered and recycled in a brine purification process. The remaining mercury tainted sludge was placed into the Brine Sludge Lagoon. When LCP purchased the property they continued to process chlorine using the same process method with a few minor modifications. In 1975, LCP modified the electrolysis process by switching from a graphite anode to a dimensionally stable anode. The components of this anode would allow the leaching of the mercury so that the brine sludge could be recycled. Other products produced at LCP are caustic soda, hydrogen chloride and bleach. (Preliminary Report on Brine Sludge Lagoon).

In 1976, LCP investigated ways to clean the Brine Sludge Lagoon and remove mercury from the wastes that were being produced. They contracted Chem-fix of Pittsburgh to set up a temporary lab and to construct the Chem-fix Lagoon to receive non-contaminated wastes. They operated the lagoon for six days and determined that this was not a practicle means of clean-up and the lagoon was abandoned. LCP investigated the possibility of mercury recovery from the brine sludge via a roasting system in 1978. The roaster was designed and built to vaporize mercury from steam dried sludge. This would allow the solid waste to be shipped off site to a sanitary landfill. An Administrative Consent Order (ACO), issued September 1, 1981, required LCP to submit an application for a hazardous waste facility permit to operate the roaster unit. On June 30, 1982 the Bureau of Hazardous Waste Engineering denied the permit and LCP subsequently abandoned the process. Since the permit was not approved, LCP was also required to close the Brine Sludge Lagoon under the September 1, 1981 ACO.

Closure Plans for the two lagoons were submitted by February 1983 and approved on November 7, 1983. During the Closure of the lagoons, LCP closed down the production facilities in order to eliminate employee exposure to mercury. The closure of the lagoons was completed in 1984.

In June of 1984, LCP submitted a facility closure plan to NJDEP. This included the complete closure of all production areas due to economic reasons. The closure was completed in 1985. Since the closure of the production areas, LCP has operated as a storage and transfer station for methylene chloride, potassium hydroxide, sodium hydroxide and hydrochloric acid that is produced by other LCP facilities. The caustics and methylene chloride are stored in above ground tanks (five tanks, maximum volume 122,800 gallons). Hydrochloric Acid is pumped directly from tank cars to tank trucks.

Operations conducted by Union Carbide include the bottling, storing and transferring of hydrogen. They compress liquid hydrogen to hydrogen gas, bottle it and ship it to their clients. Occasionally they produce gas mixtures of hydrogen with either argon or nitrogen.

Union Carbide has had two environmental releases. One was an air release, which occurred on September 15, 1988 when a safety valve blew off a truck causing a release of hydrogen gas (60,000 cubic feet). The other was a series of oil releases that occurred over a period of several years. The soil contamination was reported by Union Carbide on October 14, 1987 to NJDEP's Division of Hazardous Waste, Metro Bureau of Enforcement. Union Carbide was issued a Notice of Violation (NOV) on December 1, 1987 for the discharge of a hazardous substance. They responded to the violation by contracting IT Corp to excavate the oil contaminated soil near their past waste oil storage area. The soil was excavated and backfilled to conform to the sites topography in May 1988.

Also in 1988, Union Carbide underwent a plant upgrading that was overseen by IT Corp. This included the dismantling of a hydrogen tank, cleaning and replacing of compressor parts and pipelines. A small amount of mercury was recovered from the area of the hydrogen tank by IT Corp.

Microcell Technologies Inc. is a pilot plant that produces small, hollow glass spheres that are used as a strengthener in steel. Microcell does not store, treat or process any hazardous substances. They have a completely closed cooling system so there is no requirement for a discharge permit. There is no evidence of environmental releases at this site.

Kuehne Chemical Company was contracted by LCP to handle the loading of LCP's products. Kuehne also manufactured sodium hypochlorite and chlorine gas. On January 8, 1981 an NJDEP inspector visited Kuehne and had noted a violation in their NPDES #NJ0027707 discharge to surface water permit. Kuehne's discharge had both high and low pH levels and elevated levels of free chlorine. On October 7, 1981 NJDEP Division of Water Resources issued an Administrative Penalty Assessment against Kuehne for \$17,500.00. Kuehne ceased operations at the site on January 27, 1981.

LOCAL DEMOGRAPHICS:

LCP is located on 26 acres of filled marshland in the city of Linden, Union County, New Jersey. The property is located in an industrial area along the Arthur Kill. The site is bordered by the Kill (to the east), GAF Corp. (to the west and north) and Linden Roselle Sewage Authority and Northville Industries Corp. (to the south). Densely populated residential areas are located approximately 1.5 miles to the west with the nearest residential home being approximately 0.5 miles west on S. Wood Avenue. The estimated populations living within a one mile and a three mile radius of the site are 7 and 62,000 people, respectively.

TOPOGRAPHY/HYDROGEOLOGY:

According to aerial photographs there are three major topographic changes at the LCP site. Originally S. Branch Creek flowed through the LCP property to the Arthur Kill. Between 1974 and 1977 the creek was dammed on both sides of the production area. This resulted in two small ponds on GAF's property. The creek presently flows from LCP's storage tanks to the Kill. The other two changes regard the Chem-fix Lagoon and the Brine Sludge Lagoon.

The Chem-fix Lagoon was constructed and operated in 1976. The Brine Sludge Lagoon was constructed by erecting earthen dikes to contain the sludge in the early 1960's. In 1984, the Chem-fix Lagoon was dewatered, excavated and back filled to conform with the site's topography and the Brine Sludge Lagoon was dewatered and capped closed. The 20 plus years of filling has caused the Brine Sludge Lagoon to be elevated approximately 40 feet above sea level.

LCP is underlain by the Brunswick Formation which consists mostly of organic clays, silt, sand, gravel and a shale bedrock. The first 10 to 15 feet below the surface of LCP is unconsolidated fill composed of silts, sands, gravel, crushed stone and brick. Beneath the fill is a dark gray organic clay layer that extends to the bedrock. Throughout the clay layer there are lenses of sand and gravel. Also between the fill and clay layers there are occasionally peat mats. The red-brown shale bedrock is encountered between 40 and 50 feet below the surface.

The groundwater in this area is not used as a potable water source due to the salt intrusion from nearby coastal waters. There are two public supply well fields within a four mile radius of LCP. One belongs to the Elizabethtown Water Company and is located approximately 3.5 miles northwest of LCP. The other well field is owned by the City of Rahway and located approximately 3.5 miles west of LCP. The wells range from 50 to 350 feet in depth and are all screened in the Brunswick Formation.

LCP monitors its groundwater under NJPDES permit (NJ0003778). The six monitoring wells currently maintained by LCP were installed along the perimeter of the Brine Sludge Lagoon in 1981. The following table lists the well numbers, total depth and screened interval.

<u>WELL NO.</u>	<u>TOTAL DEPTH (feet)</u>	<u>SCREENED INTERVAL (feet)</u>
MW1	38.50	18.00-38.50
MW1A	10.00	5.00-10.00
MW2	39.48	18.00-28.00
MW3	31.77	15.00-30.00
MW4	39.18	18.00-38.00
MW5	38.00	8.00-38.00

LCP currently monitors five of the six wells (not MW1A) to determine the impact of the Brine Sludge Lagoon on the groundwater. Past monitoring reports have indicated that groundwater quality criteria had been exceeded for iron, manganese, total organic halogens (TOX), arsenic, cadmium, chromium, lead, mercury, selenium, silver and radium. During RCRA Facility Assessment visual site inspections (VSI) conducted by NJDEP Bureau of Planning and Assessment on December 20, 1987 and April 13, 1989, the presence of volatile organic (VO) vapors were detected in headspace of Monitoring Wells 1, 2, 3, and 4. The wells are sampled quarterly for total organic carbon (TOC), TOX, phenols, dissolved metals and a few other inorganics.

LCP was required to install four new monitoring wells under their final NJPDES permit issued on October 30, 1987. LCP wished to contest the well installation and requested an adjudicator hearing on February 25, 1988. On March 28, 1988, Donald DeNoon and Karl DeVoe of LCP, Michael McEachern of Geraghty and Miller, LCP's hydrogeologic consultant, and representatives of the Division of Water Resources (DWR) met to discuss the installation of new wells and the adequacy of the present monitoring system.

The DWR had three concerns with the present monitoring system. They were:

- The well screens are not all the same length and the wells are not all the same depth.
- A release from the facility might be diluted to a concentration below the detection limits.
- A leak from the lagoon might be moving above the main groundwater system as "perched water" because of the natural glacial deposits beneath the lagoon are low in permeability (G & M proposal 5/10/88).

To address these concerns Geraghty and Miller proposed that the wells be monitored with the use of a temporary "packer" or plug that would isolate the top five feet of screen that is below the water table. The DWR agreed that the study should be conducted.

In July and August 1988 Geraghty and Miller collected groundwater samples and analyzed them for antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, silver, thallium and pH. The samples collected on July 27, and August 30 were conducted with the use of a temporary packer and the August 29 sampling was conducted without the use of the temporary packer. MW1 and MW1A did

not utilize a packer during the July 27 and August 30 sampling. This is because MW1A is a shallow well and MW1 was filled with sediment isolating only the top four feet of screen below the water level. The analysis indicated that MW1A exceeded the New Jersey Groundwater Quality Standard of 50 ppb, for arsenic, with levels of 73 ppb, 76 ppb, and 96 ppb. All other parameters monitored were below New Jersey Groundwater Quality Standards (NJGWQS) for all samples from all wells.

A comparison of the analytical results for wells sampled with a packer (July 27) and without a packer (August 29 & 30) revealed no significant differences, except in MW2, which exhibited an increase in barium when the packer was utilized. The concentration without the packer was 390 ppb while the concentrations with the packer were 750 ppb and 670 ppb. All concentrations were below the NJGWQS limit of 1,000 ppb. Mercury was detected only in MW1A. The concentrations for all three sampling dates were nearly identical; 0.58 ppb, 0.57 ppb, and 0.58 ppb. Again all of the concentrations were below the NJGWQS limit of 2 ppb. Also, a trace amount (8 ppb) of lead was detected in MW3 on the July 27 sampling round. Lead was not detected in any of the other wells or during either of the August sampling episodes. The lead concentration was below the NJGWQS limit of 50 ppb.

These analyses lead Geraghty and Miller to conclude that since there was no significant differences, except for barium in MW2, that there is no dilution occurring in the deep wells. Also, based on data provided by LCP, it has been determined that LCP has never used arsenic, therefore, the presence of arsenic is due to an outside source of contamination. The relatively invariant contaminant concentrations and the proximity of the well to the Arthur Kill suggest that the mercury and arsenic detected in the well represent background conditions in the Arthur Kill rather than contamination resulting from the LCP facility. (G & M January 89 Sam Report).

As of April 1989, the DWR had not yet reached a decision as to whether LCP would be required to install the additional monitoring wells. They also are considering amending the permit to include an analysis of volatile organics based on the findings of the December 22, 1987 VSI.

SURFACE WATER:

The surface waters of concern are the Arthur Kill, which borders the site on the east, and South Branch Creek, which flows through a section of the site and is a tributary to the Arthur Kill. The Arthur Kill is classified as "Saline Estuarine Waters: SE2" by the DWR and is used for recreational boating. The Peregrine Falcon, an endangered species, is known to hunt in the salt marshes near the Kill.

LCP operates a waste water treatment plant. When the plant was in full operation the waste waters from the electrolysis and sludge roaster as well as the plant's surface water run-off were treated and discharge to South Branch Creek under NJPDES permit NJ0003778. However, since the shut down of the plant's processing units, only surface run-off is treated. After treatment, the water is stored in an above ground tank. Due to the small amount of treated water, LCP discharges about two times a year.

From May 23 to May 26, 1988, Cosper Environmental Services Inc. performed a bioassay on LCP's effluent. The effluent samples collected were clear with no noticeable odor. There was a small amount of sediment present. The test organism for the bioassay was the sheeps-head minnow. There was no detection of the disease in the brood stock. For this bioassay, there was a 5.0% mortality at 100% effluent. The results were satisfactory with a LC50 of >100% effluent.

II. PERMITS:

1. NJPDES: LCP was issued a surface water discharge permit NJ0003778 on August 10, 1987, which expires April 30, 1991. The permit allows LCP to discharge treated surface run-off and spill wash-down to South Branch Creek (classified SE-3).

LCP was issued a groundwater discharge permit NJ0003778 on October 30, 1987, which expires November 29, 1992. The permit requires LCP to continue to monitor the wells surrounding the closed Brine Sludge Lagoon in order to determine the impact of the lagoon on the groundwater.

2. Air: Currently LCP has a grandfathered air pollution control permit #076565, which is for the vents on their methylene chloride storage tanks. Previously LCP had eight air permits for hydrogen chloride tanks and several chlorine process apparatus. Due to the closure of the production areas at LCP, these permits have been deleted.
3. LCP submitted their Part A RCRA application on August 13, 1980. Since the only RCRA regulated unit was certified closed in September 1985, a Part B application was considered unnecessary in lieu of a post closure permit.

III. SOLID WASTE MANAGEMENT UNITS:

Twelve solid waste management units were identified at the LCP facility. The units are: The Brine Sludge Lagoon, the Chem-fix Lagoon, the 500K Tank, the Waste Oil Drum Storage Area, Area Between Building 231 and Railroad Tracks, South Branch Creek, the Bullet Tanks, Sludge Roaster, Salt Silo 4, past GAF Waste Water Treatment Area, the cracks in Building 230 and 240, and the Effluent Treatment Building. The only RCRA regulated unit is the Brine Sludge Lagoon.

UNITS SUMMARY:

1. Brine Sludge Lagoon: The lagoon is an unlined earthen surface impoundment, which is surrounded by earth dikes that extend about seven feet higher than the facility's average ground level. The lagoon is trapezium in shape, approximately 275 feet by 200 feet by 220 feet by 80 feet. The total waste volume is estimated to be 30,900 cubic yards, which was accumulated for over 20 years before the lagoon was closed in 1984.

Under an Administrative Consent Order dated September 1, 1981, LCP agreed to submit a closure plan to the NJDEP for the lagoon. LCP submitted the plan on July 16, 1982. The plan was amended on February 28, 1983 and approved by the NJDEP on November 7, 1983. The lagoon

received the excavated waste from the Chem-fix Lagoon, which was dewatered, compressed and covered with a two foot clay cap. The cap was then covered with a foot of soil and seeded. The closure was completed in November 1984. During the closure of the lagoon, NJDEP and USEPA required LCP to suspend chlorine productions to eliminate worker exposure to mercury.

In 1981, LCP installed six monitoring wells to determine if there was any impact on the groundwater from the lagoon. These wells are sampled quarterly for TOC, TOX, phenols, dissolved metals and a few other inorganics. On several occasions between 1982 and 1987 quarterly reports indicate that concentrations of lead, chromium, cadmium, mercury, selenium and silver have exceeded the NJPDES permitted level.

Under the July 31, 1981 NJDEP Administrative Consent Order, LCP was required to implement a monitoring program to evaluate the release of mercury and other metals to the ambient environment. The program includes air, groundwater and soils obtained from land borings and creek sediments. Geraghty and Miller were retained to conduct all sampling except air. Recon Systems was contracted to perform air sampling. (Attachment B).

Recon collected two sets of sampling data on June 4, 1981. The first set of samples was collected three feet above the surface of the waste pile. Concentrations of mercury ranged from 1000 to 5000 nanogram/cubic meter (ng/m^3) to 12,600 ng/m^3 of mercury with an average concentration of 6400 ng/m^3 . Based on the mercury contamination levels, crosswind speed and the lagoons dimensions an approximately 113 g/day of mercury is emitted by the lagoon.

Groundwater samples were taken on October 6, 1981 and October 15, 1981 and analyzed by LCP's lab for dissolved mercury. All samples were below the USEPA Primary Interim Drinking Water Standard of 0.002 ppm. The water samples were also sent to Princeton Testing Labs to be analyzed for calcium, barium, iron and mercury. Again all wells had levels below 0.002 ppm for mercury. However, the levels of barium ranged from 2.0 ppm to 7.0 ppm which exceed the NJDEP Action/Cleanup Level of 1 ppm.

Soil samples were taken from the monitoring well borings for MW1, MW2, MW3, MW4, MW5. The samples were analyzed by LCP for desorbable mercury with samples taken every 6 inches from the surface to the total depth of each well. Levels of mercury ranged from 0.26 ppm to 772 ppm, with the concentrations decreasing with depth. Surface soil samples were also taken near the sludge roaster and across Avenue B near the railroad tracks. The samples were analyzed in the same manner as the previous samples and had recorded levels of mercury ranging from 27.45 ppm to 1,580 ppm. Also, one creek-bed sediment sample was taken and analyzed by LCP for mercury. The sample contained 46.42 ppm of mercury. All of the surface samples exceeded the NJDEP Action/Cleanup Level of 1 ppm for mercury.

On April 13, 1989 the Bureau of Planning and Assessment (BPA) conducted a RCRA Visual Site Inspection (VSI) of the LCP facility. The closed lagoon appeared secure. During the investigation of the

monitoring wells, volatile organics were detected in the headspace of the wells by both the OVA and Hnu meter with readings ranging from 2 ppm to 350 ppm. Also, on a previous VSI conducted by the BPA on December 22, 1987, organic vapors were detected in MW1 and MW2 with the Hnu meter. Due to the presence of organic vapors in the headspace of the wells, it is recommended that the NJPDES 30 year post closure monitoring program be expanded to include an initial scan for priority pollutants and volatile organics. Due to the presence of mercury contamination, a RFI is recommended for this unit to determine the extent of the contamination. The RFI should consist of soil sampling around the perimeter of the lagoon to determine if any hazardous materials have leached from the lagoon. The sample analysis should include, but not be limited to, total mercury, total barium, volatile organics and priority pollutants. If this sampling indicates significant levels of contamination exist, a more detailed RFI is recommended.

2. The Chem-fix Lagoon: The Chem-fix Lagoon was an earthen surface impoundment which was in operation for a few months in 1976. The lagoon dikes were constructed to a height of eight feet with an earthen core and crushed stone cover. Two 0.20 mil thick visquene plastic liners were installed in the lagoon which was also equipped with a perforated under drain system for leachate collection. Any leachate collected was pumped to the effluent treatment plant. The lagoon received approximately 460 cubic yards of treated brine sludge.

The Chem-fix Lagoon was closed in 1983. The contents of lagoon were excavated and placed into the Brine Sludge Lagoon. It was then back filled, graded and seeded. The proximity of the Chem-fix Lagoon to the Brine Sludge Lagoon allows the NJPDES permitted wells to monitor any leachate releases to the groundwater from either lagoon. During the VSI on April 13, 1989, the lagoon appeared secure and there is no evidence of releases. Due to the proximity of this lagoon to the Brine Sludge Lagoon and the potential to have received mercury waste; a limited RFI is recommended. The RFI should consist of soil sampling to determine if hazardous wastes have leached from the lagoon. The sample analysis should be identical to the analysis of the Brine Sludge Lagoon.

3. The Waste Oil Drum Storage Area: The Container Storage Area is a 300 square foot concrete pad, one foot thick, with a six inch curb. During full plant operations up to 40 (55 gallon) drums of waste lubricating oils, transformer oils, degreasing solvents, and dewatered brine sludges could be stored there. These wastes were shipped off-site for proper disposal within 90 days.

During the December 22, 1987 VSI, there were no drummed waste being stored, however the pad was covered with an absorbant material and oily residues were noted on the gravel in the surrounding area. During the April 13, 1989 VSI, stained soils were also noted. Using air monitoring equipment (Hnu and OVA), organic vapors were detected in the soil (10 ppm on the OVA and 6 ppm on the Hnu). It is recommended that a RFI be conducted on this unit to determine the extent of the release. The RFI should consist of soil sampling and the analysis should include, but not be limited to, petroleum hydrocarbons, volatile organics, total mercury and priority

pollutants. Based on the results of the soil sampling it may be required that the groundwater be monitored.

4. Area Between Building 231 and Railroad Track: In August 1980, NJDEP was contacted by a LCP employee. The employee stated that one day in 1973 or 1974, LCP used a steam shovel to take some of the brine sludge from the lagoon and spread it on the ground behind the compressor building (#231). In 1981, during the Geraghty and Miller sampling episode, two surface soil samples (S-3, S-4) were taken near this area. The samples were analyzed for desorbed mercury. The results were: S-3, 1070 ppm and S-4, 1580 ppm of mercury. These levels of mercury are the highest detected in any sampling conducted on the LCP site. These concentrations are 300 ppm greater than the soil samples near the Brine Sludge Lagoon. Due to the presence of mercury contamination, a RFI is recommended for this unit to determine the extent of the contamination. The RFI should consist of soil sampling which includes, but not be limited to, total mercury and priority pollutants. If the results of the soil sampling indicate significant contamination, further investigation will be necessary to determine the extent.
5. 500K Tank and Surrounding Areas: The 500,000 gallon tank is located between Avenue C and Avenue B. The tank has served two purposes. Originally the tank was used to store sodium hydroxide and later became incorporated with the effluent treatment system and was used as a storage tank for wastewater. Presently the tank is not used. The area surrounding the tank was paved in 1982.

From 1980 to 1982, a series of NJDEP Hazardous Waste Enforcement inspections revealed several releases in the area of the 500K Tank. The releases in this area are:

- 9/17/80 Brine Sludge was observed on the gravel near the 500K "collection tank."
- 1/21/81 During the inspection a liquid was observed spewing from a cracked PVC pipe near the 500K Tank and pump pit.
- 10/22/81 A brine sludge slurry release from a transfer line was evidenced by a 1 by 15 foot spill area located on Avenue B between the pump pit and the Brine Sludge Lagoon. There was also a hydrochloric acid spill approximately 15 feet northwest of the 500K Tank.
- 4/13/82 Sodium sulfide crystals were evident on the gravel surface in the pump pit area.

Due to documented releases, a limited RFI is recommended for this unit. The RFI should consist of soil sampling and the analysis should include, but not be limited to, total mercury, hydrochloric acid, sodium hydroxide, sodium sulfide, and priority pollutants. A more in-depth RFA may be required based on the results of the soil sampling.

6. South Branch Creek: South Branch Creek is a tidal arm of the Arthur Kill that flows along the eastern border of the LCP property. Since

1974, LCP has had three discharges to the creek. On or about October 30, 1972 and February 7, 1974, there was an overflow of supernatant in contact with brine muds from LCP's Brine Sludge Lagoon into South Branch Creek. LCP pled guilty to violation 3 USC 1311 (a) for both occurrences on September 25, 1975. A fine of \$5,000 was levied for each occurrence. The third incident occurred on August 15, 1979. Due to a sodium chloride block in LCP's east saturator an excess of mercury tainted brine overflowed the saturator. The surge of flow exceeded the surge capacity of the wastewater system. This caused an estimate of 10,000 to 20,000 gallons of brine to flow into South Branch Creek. LCP notified NJDEP and the EPA samples taken by the Coast Guard revealed the mercury contamination of the spill was 8.6 ppm.

In 1981, a sediment sample was taken from the creek. The sample was analyzed by LCP's Labs for mercury. The mercury concentration was 46 ppm, which exceeds NJDEP action/clean-up level of 1 ppm. Due to past releases to the South Branch Creek a limited RFI is recommended for this unit. The RFI should consist of sediment sampling and surface water sampling both upstream and downstream of LCP's discharge (DSN 001). The sample analysis should include, but not be limited to, total mercury, barium and priority pollutants.

7. Bullet Tanks: These tanks have been abandoned since about 1983. The Bullet Tanks were used to store brine sludge. A series of NJDEP Hazardous Waste Enforcement inspections have revealed that there were continual problems with brine containment in the area under the tanks. From September 17, 1980 until April 13, 1982 the inspections stated that the containment area had brine residues. On October 9, 1980 and January 22, 1981 the area was full with the potential to overflow.

Due to the potential for a release to exposed soils a limited RFI is recommended for this unit. The RFI should consist of soil samples around the bermed area of the abandoned Bullet Tanks. The sample analysis should include, but not be limited to, total mercury, acid-base extractables and priority pollutants. Based on the results of the soil sampling it may be required that an additional investigation be conducted.

8. The Sludge Roaster: The Sludge Roaster was constructed in 1978 to vaporize mercury from steam dried brine sludge. The roaster was built on a 16 x 40 foot concrete pad, one foot thick, with drain channels, that connect to the effluent treatment plant, and a cinder block curb around the pad.

Under an Administrative Order issued on September 1, 1981, LCP was required to submit an application for a Hazardous Waste Facility permit to operate the roaster unit. The permit was denied on June 30, 1982 by the Bureau of Hazardous Waste Engineering (BHWE) and LCP subsequently abandoned the process.

An enforcement inspection by the Division of Environmental Quality, Air Pollution Control Program on November 5, 1981 disclosed a hole in a muffler plate on the sludge roaster. This allowed an excessive quantity of mercury vapors to be released to the atmosphere.

In 1985, the sludge roaster was dismantled and most of its components were shipped to other LCP facilities. No further action is necessary for the roaster unit, at this time.

9. Salt Silo 4: This silo was used to store the brine sludge prior to disposal in the lagoon. During the October 9, 1980 inspection brine sludge was observed on the ground around the silo. The silos were removed in 1985. A limited RFI is recommended on this unit due to the potential of releases to the soil. Soil sampling should be conducted and the analysis should include, but not be limited to, total mercury and priority pollutants. An additional investigation may be required based on the soil results.
10. The Effluent Building : This building was originally used as a brine filtering facility. LCP began wastewater treatment in this building around the time of the lagoon closures. The October 9, 1980 inspection indicates that there was brine caked on the floor near the filters. This was washed to the sump next to the 500K Tank and eventually treated. Because there are no documents of a hazardous release from this area, no further investigations are warranted at this time.
11. Past GAF Waste Water Treatment Area: From past GAF and LCP site maps it appears that the waste water treatment plant that was operated by GAF was located on the western side of building 220. It is believed that the plant was used primarily for pH neutralization from the 1950's to the early 1970's. The site presently is paved over and supporting a transformer substation. No further investigation is warranted at this time.
12. Cracks in the Floor of Building 230 and 240: The employee complaint also stated that because of Occupational Safety and Health Administrative visits LCP re-cemented the floors of Buildings 230 and 240 to cover cracks. According to the employee these cracks may have exposed soils that could have been contaminated with mercury. The employee felt that this was not investigated by LCP.

In 1976, OSHA inspected the buildings and did report openings in the floor and wall of these rooms. However, there was no indication of possible soil contamination with mercury.

OSHA also conducted a health survey in April 1985. This survey concluded that any workers in Buildings 230 and 240 are exposed to mercury and mercury vapors above the OSHA 8 hr-time weighted average permissible exposure limit. According to the Plant Manager, John Canonton, LCP still monitors for mercury vapors and worker exposure even though they no longer produce chlorine.

Due to the potential of soil exposure to mercury, a limited RFI is recommended for this unit. Soil sampling should be conducted and the analyses should include, but not be limited to, total mercury and priority pollutants.

ADDITIONAL CONCERN:

The 1982 Waste Lagoon-Ground Water Monitoring Report submitted by Geraghty and Miller stated that a possible source for the mercury

contamination at LCP was due to contaminated fill. There are three conditions which suggest that this is not the case. The data presented in the report indicate that soil samples below the fill layer have levels of mercury exceeding 1 ppm, the NJDEP action level. Based on the history of the site, the soils at GAF and LCP should have a similar composition. However, soil sampling conducted at GAF by NJDEP Bureau of Planning and Assessment, in December 1988 (data not reviewed for QA/QC), indicated lower mercury levels than LCP. GAF had levels of mercury ranging from <0.1 ppm to 347.8 ppm (Ave 29.1 ppm) and the levels of mercury for LCP ranged from <0.1 ppm to 1,580 ppm (Ave 102.4 ppm). The highest levels of mercury 1,070 ppm and 1,580 ppm are in the area of alleged surface dumping, it is likely that this is a probable cause of mercury contamination. It is suggested that if the recommended soil sampling yields mercury levels similar to those of 1982, LCP should submit a remedial plan to address the contaminated soil.

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State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
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TRENTON, NEW JERSEY 08625

GEORGE G. McCANN, P.E.
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M E M O R A N D U M

To: Brian Crisafulli
Bureau of Compliance and Technical Services
Division of Hazardous Waste Management

Through: Tracy Wagner, Supervisor; Kenneth Sier, Chief
Bureau of Ground Water Pollution Abatement
Division of Water Resources

From: Jill Monroe, Geologist
Bureau of Ground Water Pollution Abatement
Division of Water Resources

Subject: CME for LCP Chemicals and Plastics, Inc.
Linden, New Jersey

Background and Facility Information:

LCP Chemicals and Plastics, Inc. (LCP) is located on Tremley Point in Union County, New Jersey. LCP owns the 26 acre site which contains a chemical manufacturing facility which produced liquid chlorine. The Tremley Point area has been developed for industry, with manufacturers and tank farms located in the immediate area of LCP. The Point extends to the Arthur Kill, a tidal waterway used for recreational purposes and a wildlife habitat.

LCP operated a liquid chlorine manufacturing process at the facility between 1972 and 1985. Prior to LCP ownership, GAF owned the facility and also manufactured liquid chlorine. The process used by both GAF and LCP was the "mercury cell process" which yielded a chlorine gas through the electrolysis of a sodium chloride (brine) solution in the presence of metallic mercury. Other products included sodium hydroxide and hydrogen gas.

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LCP employed a brine purification process to recover and recycle metallic mercury. The process was incomplete and a waste product of mercury contaminated brine sludge resulted. An unlined surface impoundment was used in the brine purification process, as well as being the deposition site for the mercury contaminated brine sludge. Between GAF and LCP, the unlined surface impoundment was used for approximately 20 years, between 1962 and 1982. In 1982, LCP removed the unit from operation.

The unlined surface impoundment was constructed above grade, according to the available records, by the construction of berms. It rested on fill placed on the site in the 1950's over the native tidal wetland sediments. The surface impoundment is located on the eastern edge of the site, adjacent to a tidal creek named South Branch Creek, and the neighboring tank farm of Northville Industries. South Branch Creek flows immediately adjacent to the surface impoundment and into the Arthur Kill located approximately 1100 feet to the east of the surface impoundment.

The mercury contaminated brine sludge (200-500 ppm of mercury) was closed in place in the unlined surface impoundment when the unit was closed. An estimated waste volume of 30,900 cubic yards currently remains in the unit. Closure involved drying the sludge, regrading, and the placement of a clay cap over the unit, followed by the placement of topsoil and the establishment of a vegetative cover in accordance with the November 7, 1983 closure/post closure approval issued by the Bureau of Hazardous Waste Engineering, Division of Waste Management. The closure/post closure plans were submitted in accordance with an Administrative Consent Order signed by LCP and the Department on September 16, 1981.

The facility had been required to monitor existing ground water monitor wells and to maintain the cover soil and cover vegetation on the closed in place surface impoundment under a NJPDES-DGW permit (NJ0003778). This permit was recently reissued on October 30, 1987. Conditions in the final permit related to the installation of new ground water monitor wells are being negotiated by LCP. The Department is currently discussing with LCP a means to settle the differences.

A possible means to settle the contested permit conditions related to the installation of new ground water monitor wells involves an "interim" ground water monitoring program. LCP recently submitted a proposal to monitor the single shallow monitor well, MW 1-A, and the top five (5) feet of ground water in all of the other monitor wells, MW's 1, 2, 3, 4 and 5, by using a well packer. This proposal, submitted under cover of letter dated May 5, 1988 by Geraghty and Miller, was approved with minor changes by the Department on May 24, 1988. The proposal should

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lend additional insight on water quality in the fill/native soil interface. Further, by isolating the top five (5) feet of ground water in each well, information will be obtained on the quality of the water closest to the base of the closed in place surface impoundment at each monitor well site. This should clarify some questions related to the adequacy of the existing ground water monitoring system.

Geology/Geohydrology and Ground Water Monitoring:

The LCP facility is located on heterogeneous fill material. The area was originally a tidal wetland area influenced by the nearby Arthur Kill. The fill is composed of sand, gravel, brick and slag and is approximately 10 - 15 feet thick across most of the site but being shallower, approximately 5 feet in thickness, near South Branch Creek. The fill was placed over tidally deposited sands, silts, clays and peats. Beneath the tidal sediments are glacial till deposits overlying the Brunswick formation. A sandy "channel" appears to exist beneath the surface impoundment which may have been a tidal stream bed at one time. Bedrock is located approximately 40 feet below grade.

The site is hydrogeologically complicated due to the variability in the tidal and glacial deposits and the fill materials, and due to the proximity of the tidal waterways which influence ground water quality and water levels in the wells. Further, adjacent industrial land use may be impacting ground water quality as well as recharge/discharge characteristics and ground water contours.

LCP installed a detection ground water monitoring system in 1981 in accordance with the above referenced Administrative Consent Order. Five (5) monitor wells were installed along the edge of the surface impoundment, between the surface impoundment and South Branch Creek. One (1) well was installed in what was considered an upgradient location inland from the tidal creek but still adjacent to the surface impoundment. Monitoring of these wells during closure and post closure was required in the November 7, 1983 approval granted by the Bureau of Hazardous Waste Engineering, and the NJPDES-DGW permit issued by the Division of Water Resources on December 23, 1983 specified the monitoring of five (5) of the six (6) existing wells. MW 1-A was not required to be monitored under the December 23, 1983 NJPDES-DGW permit.

The monitor well boring logs (attached to this checklist) and LCP's consultant indicate that 1 1/2 inch diameter monitor wells were installed and screened in what was determined to be the most permeable lithologies. The screen length was chosen to obtain an "adequate" sample, given the slow permeability of the sediments. The screen location was chosen to detect a vertical migrating release from the surface impoundment through the fill, the tidal

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sediments and the glacial till. Only one monitor well screen was set at a shallow enough depth to sample ground water at the fill/native soil interface which could also establish the existence of a vertical gradient since it was installed adjacent to a deeper monitor well.

The most recent ground water quality data (January, 1988) indicates that ground water quality criteria for iron and manganese have been exceeded, and that TOX levels in all of the wells adjacent to the South Branch Creek are greater than 1000 ppb. Between 1982 and 1987, ground water monitoring results have been exceeded for arsenic selenium, silver, lead, chromium, cadmium, mercury and radium. The RCRA-RFA investigation also revealed the presence of organic vapors in the head space of existing monitor wells 1 and 2 which may correlate with elevated levels of Total Organic Halogen results in the ground water sample analyses.

Conclusions and Recommendations:

The Department's review of the ground water monitor well locations and construction specifications, consultant reports and data reveal the following concerns:

1. There are currently no consistent ground water quality results from the "shallow" monitor well, labeled 1-A, which monitors the ground water in the zone of the fill/native soil interface.

The implication of this is that a possible route for contaminant release is not monitored. The February, 1982 report prepared by LCP's consultant, Geraghty and Miller, indicated that the base of the fill appeared saturated. The unlined surface impoundment was constructed over heterogeneous fill, presumably more permeable than the native underlying sediments. If leachate was being generated from the surface impoundment, or if through vertical movement of the water table contaminants are being solubilized from the waste materials closed in the surface impoundment, this water could be moving horizontally above the less permeable sediments of the tidal deposits and glacial till in the direction of decreasing hydraulic head. The discharge point for shallow ground water is assumed to be South Branch Creek.

2. The horizontal and vertical gradients and flow paths, and the degree of hydraulic connection between the fill, the tidal sediments and the glacial till, are site characteristics which have not been adequately defined.

The implication of this is that a vertical flow gradient cannot be determined. Without a determination on whether the ground water beneath the unit behaves as one system, or if some ground

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water exists under semi-confined or confined conditions, the water levels in the existing ground water monitoring wells are useless in determining the horizontal direction of ground water flow necessary to identify upgradient and downgradient monitoring locations. The need for this information may be represented by the apparent shifts in upgradient and downgradient monitoring points.

3. The existing, deeper, wells screen a large segment of the underlying sediments.


The implication of this is that ground water contaminants may be diluted with ground water that is not contaminated. Further, the monitoring system should be sampling the water in the uppermost aquifer, or portion of the uppermost aquifer, which appears to be the saturated zone at the fill/native soil interface.

4. Statistical comparison of upgradient and downgradient wells screened at different depths, finished with different screen lengths, and constructed through different techniques, etc. may not be valid. As such, the RCRA and the NJPDES regulations may not be able to be complied with.

LCP has not met the statistical requirements for RCRA or NJPDES. Their argument is based on the tidal influence on the indicator parameters required to be analyzed, i.e. sulfate, total dissolved solids, etc. LCP has not proposed specific alternate parameters to be analyzed which would more adequately reflect a release from the surface impoundment, but the question remains on whether a positive or negative result to the test would be meaningful given the current monitoring system design.

In closing, LCP has successfully argued in the past that the existing wells are screened in the sediments most likely to detect a release, although the screens of most wells are separated from the base of the surface impoundment by tidal muds and glacial till which have restrictive permeabilities and have low transmissivity. The Department's main belief is that the avenue of release which is not being monitored is the fill/native soil interface. Although the surface impoundment wastes are ... to prevent infiltration from generating leachate, any shallow ground water migrating horizontally beneath the surface impoundment and above the tighter native sediments could flush contaminants from the soil and into the South Branch Creek. This shallow, horizontal migration route, which may be seasonal, should not be neglected in the ground water monitoring program.

Another point which must be considered is that although the existing ground water monitoring system does not appear to strictly meet the letter of the regulations, the existing ground water monitoring data indicates periodic elevations in specific

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metals and Total Organic Halogen. These results should be further investigated, in addition to the work needed to define the geologic parameters influencing ground water movement and the surface features which may also influence ground water movement and quality. The "interim" ground water monitoring program, described above, should provide some valuable information needed to evaluate the ability of the existing monitor wells to detect a release from the closed in place surface impoundment.

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RESULTS OF THE JULY/AUGUST
1988 GROUND-WATER SAMPLING PROGRAM,
LCP CHEMICALS-NEW JERSEY
LINDEN, NEW JERSEY

January 1989

Geraghty & Miller, Inc.
Ground-Water Services
125 East Bethpage Road
Plainview, New York 11803

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RESULTS OF THE JULY/AUGUST
1988 GROUND-WATER SAMPLING PROGRAM,
LCP CHEMICALS-NEW JERSEY
LINDEN, NEW JERSEY

INTRODUCTION

In July and August 1988, Geraghty & Miller, Inc. personnel collected ground-water samples from an existing monitoring well network at LCP Chemicals-New Jersey (LCP), Linden, New Jersey (Figure 1). The sampling was performed under special sampling conditions in accordance with the "Technical Proposal for Monitoring Well Sampling and Evaluation for NJPDES Compliance," dated May 5, 1988.

As described in the sampling plan, the purpose of the sampling program was to verify the adequacy of the existing monitoring well network to monitor any contaminants migrating from the closed brine lagoons. The protocols specified in the plan required that samples be collected from all monitoring wells with the entire screen length open to the formation. The wells were also to be sampled after the upper 5 ft of each well screen, below the water table, were isolated by use of a temporary "packer" or plug. Water passing through the well screen above the packer provides a sample representative of the isolated zone of interest. A description of the packer installation technique is provided in Appendix A. The constituents for which the wells were sampled are as follows: antimony, arsenic, barium,

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beryllium, cadmium, lead, mercury, nickel, selenium, silver, hexavalent chromium, thallium, and pH.

Laboratory analyses were performed by Environmental Testing and Certification (ETC), Edison, New Jersey, according to the U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) Protocols. The Geraghty & Miller ground-water sampling protocols used for the special sampling program are provided in Appendix A and laboratory analysis reports in Appendix B. This report provides a summary of the special sampling program and its results.

METHODOLOGY

July 27, 1988 Sampling Round

On July 27, 1988, samples were collected from Monitoring Wells MW-1 through MW-5. Prior to evacuation of the wells, static water level and well depth measurements were collected. The depth to water and calculated mean sea level water-level elevations are shown in Table 1. The configuration of the shallow water table, based on the July 27 measurements, is presented on Figure 2.

Measurement of the depth of Well MW-1 indicated that silt had collected in the well to a depth of 22.5 ft below land surface. The open screen length available was limited

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to the top 4 ft of the well screen. The installation of the packer system for Well MW-1 was, therefore, not applicable. The packer assembly was also not used during sample collection from Well MW-1A since this well was constructed with a 5 ft screen. Wells MW-1 and MW-1A were evacuated with a centrifugal pump and sampled with a peristaltic pump.

Field analyses of pH, specific conductance, and temperature are provided in Table 2. The packer system was installed on Wells MW-2, MW-3, MW-4, and MW-5, as described in Appendix A. A replicate sample was collected at Well MW-5 and labeled MW-6. A summary of the analytical results from the July 27, 1988 sampling round is provided in Table 3.

August 29, 1988 Sampling Round

Samples were collected from all wells in accordance with New Jersey Pollutant Discharge Elimination System (NJPDDES) permit requirements and use of CLP protocols, (i.e., without the use of the temporary packer). Depth-to-water measurements and calculated mean sea level water-level elevations are provided in Table 1. The configuration of the shallow water table, based on these measurements, is presented on Figure 3. Field parameter analyses are provided in Table 4.

As in the July sampling, a replicate sample was collected at Well MW-5 and labeled MW-6. A summary of the laboratory results for the samples collected August 29, 1988 is provided in Table 5.

August 30, 1988 Sampling Round

Samples were collected August 30, 1988 from Wells MW-1A through MW-5. The packer was installed in Wells MW-2 through MW-5. Well MW-1 was not sampled. Depth-to-water measurements and calculated mean sea level water-level elevations are provided in Table 1, and field parameter analyses are provided in Table 6. The water-table configuration, based on measurements made August 30, 1988, is shown on Figure 4.

The replicate sample was collected at Well MW-4 and labeled MW-6. A summary of the analytical results from the August 30, 1988 sampling round is provided in Table 7.

WATER QUALITY

All sample results were below New Jersey Ground-Water Quality Standards for the constituents analyzed, except for Well MW-1A. Slightly elevated levels of arsenic were detected in all three sampling rounds from this well (a maximum of 96 micrograms per liter [ug/L] versus the New

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Jersey standard of 50 ug/L). The well had a 5-ft screen section so no packer/non-packer comparison was possible.

As with Well MW-1A, Well MW-1 was sampled without the use of the packer since it is silted in and has only 4 ft of screen open for sampling. A comparison of analytical results from the July 27 and August 29 Well MW-1 samples detected only insignificant concentration differences.

A comparison of analytical results for wells sampled with packer (July 27) and resampling without packers, (August 29 and 30) reveals no significant differences, except in Well MW-2, which exhibited a slight increase in detected barium after installation of packer. The concentration detected without a packer (August 29) was 390 ug/L. Concentrations detected with packers July 27 and August 30 were 750 ug/L and 670 ug/L (respectively). All concentrations detected were below the New Jersey Ground-Water Quality Standards (1,000 ug/L).

Laboratory results for mercury were nearly identical for all three sampling rounds. Mercury was not detected in any well other than Well MW-1A. The results for mercury analyses of Well MW-1A samples were as follows: 0.58 ug/L (July 27), 0.57 ug/L (August 29), 0.59 ug/L (August 30). All results were below New Jersey Ground-Water Quality Standards (2 ug/L).

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A trace amount of lead (8 ug/L) was detected in Well MW-3 with the packer installed on the July 27 sample round. However, lead was not detected with the packer installed on the August 30 sample, nor without the packer on the August 29 sample. The detected value of July 27 (8 ug/L) was below the New Jersey Ground-Water Quality Standard (50 ug/L).

Ground-Water Flow

Review of the water-table contour maps (Figures 2, 3, and 4) indicates that the general direction of the horizontal component of ground-water flow was from the lagoon towards South Branch Creek during the July 27, 1988 sampling round. The direction of ground-water flow was reversed during the August 29 and 30, 1988 sampling rounds. The observed directional changes in ground-water flow reflect tidal variations.

CONCLUSIONS

1. No substantive differences were observed between the packed and unpacked sampling events.
2. Well MW-1A, which has a 5-ft screen, was the only well with any detected mercury concentrations.
3. During both the July and August sampling rounds, mercury and arsenic were detected in monitoring well

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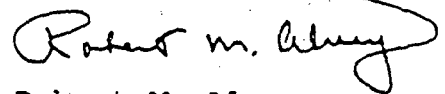
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MW-1A. The contaminant concentrations did not vary much between the two rounds or whether the samples were collected during a rising or falling tide. Based on data provided by LCP, it has been determined that arsenic was never used at the Linden facility, therefore, the presence of arsenic is indicative of an outside source of contamination. The relatively invariant contaminant concentrations and the proximity of the well to the Arthur Kill suggest that the mercury and arsenic detected in the well represent background conditions in the Arthur Kill rather than contamination resulting from the LCP facility. The current monitoring well network can therefore be used to monitor any impacts from the former lagoons and the construction of additional wells is unnecessary.

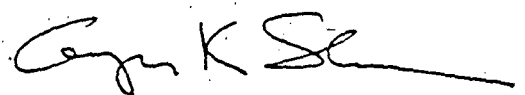
RECOMMENDATIONS

Well MW-1 should be redeveloped to remove silt and ensure that the entire screen length is open to the formation for future sampling.

Respectfully submitted,
GERAGHTY & MILLER, INC.



Robert M. Alvey
Principal Scientist/
Project Manager



Gregory Shkuda
Associate/
Project Officer

RMA/GS:jb
January 4, 1989

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Table 1. Depth to Water and Water-Level Elevations of Monitoring Wells, LCP Chemicals-New Jersey, Linden, New Jersey.

Monitoring Well Designation	Measuring Point Elevation ^a	Date Measured: 7/27/88		8/29/88		8/30/88	
		Depth to Water ^b	Water-Level Elevation ^a	Depth to Water ^b	Water-Level Elevation ^a	Depth to Water ^b	Water-Level Elevation ^a
MW-1	8.65	3.95	4.70	3.58	5.07	4.36	4.29
MW-1A	10.32	5.09	5.23	4.44	5.88	5.53	4.79
MW-2	7.66	3.14	4.52	2.68	4.98	3.64	4.02
MW-3	13.39	7.98	5.41	7.66	5.73	8.09	5.30
MW-4	11.28	5.66	5.62	5.59	5.69	5.86	5.42
MW-5	11.57	5.73	5.84	6.99	4.58	7.50	4.07

^a Ft. above mean sea level.

^b Ft. below measuring point.

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Table 2. Summary of Field Parameters Measured for Ground-Water Samples Collected July 27, 1988, LCP Chemicals-New Jersey, Linden, New Jersey.

Well	pH (standard units)	Specific Conductance (umhos/cm at 25°C)	Temperature (°C)	Remarks
MW-1	6.70	11,400	17	Red/brown, very turbid
MW-1A	6.95	7,000	22	Colorless, clear
MW-2	6.85	11,000	18	Red/brown, very turbid
MW-3	7.15	12,000	18	Pale green, clear
MW-4	6.95	12,000	20	Lt. brown, cloudy
MW-5	7.05	1,400	20	Pink, cloudy

Table 3. Summary of Analytical Results for Metals in Ground-Water Samples Collected July 27, 1988, LCP Chemicals-New Jersey, Linden, New Jersey.

Parameter (ug/L)	New Jersey Ground-Water Quality Standards (ug/L)	Sample Designations:						-----Replicates-----a		Field
		MW-1	MW-1A	MW-2	MW-3	MW-4	MW-5	MW-6	Blank	
Antimony	NS	--	--	--	--	--	--	--	--	
Arsenic	50	--	73	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	
Barium	1000	290	BMDL	750	330	90	140	140	--	
Beryllium	NS	--	--	--	--	--	--	--	--	
Cadmium	10	--	BMDL	--	--	--	--	--	--	
Chromium (Hex)	50	<10	<10	<10	<10	<10	<10	<10	<10	
Lead	50	--	--	BMDL	8	--	--	--	--	
Mercury	2	--	0.58	--	--	--	--	--	--	
Nickel	NS	--	--	--	BMDL	BMDL	--	--	--	
Selenium	NS	BMDL	--	--	--	--	--	--	--	
Silver	50	BMDL	--	BMDL	--	--	--	BMDL	--	
Thallium	NS	--	--	--	--	--	--	--	--	

Laboratory Analysis by Environmental Testing and Certification.

ug/L Micrograms per liter.

NS No standard has been established.

-- Not detected.

BMDL Below method detection limit. (Refer to Appendix B)

a Replicate samples from Well MW-5.

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FIGURES

Table 4. Summary of Field Parameters Measured for Ground-Water Samples Collected August 29, 1988, LCP Chemicals- New Jersey, Linden, New Jersey,

Well	pH (standard units)	Specific Conductance (umhos/cm at 25°C)	Temperature (°C)	Remark
MW-1	6.60	>20,000	18	Red/brown, very turbid
	6.65	>20,000		
	6.70	>20,000		
	6.70	>20,000		
MW-1A	6.90	14,500	21	Colorless, clea
	7.00	14,000		
	7.00	13,500		
	7.00	13,500		
MW-2	6.70	20,000	18	Red/brown, very turbid
	6.75	20,000		
	6.75	20,000		
	6.75	20,000		
MW-3	7.05	>20,000	18	Colorless, clea
	7.05	>20,000		
	7.05	>20,000		
	7.05	>20,000		
MW-4	7.15	>20,000	19	Brown/black, slightly turbid
	7.15	>20,000		
	7.15	>20,000		
	7.15	>20,000		
MW-5	6.95	5,000	18	Red/brown, turbid
	6.95	5,000		
	6.95	5,000		
	6.95	5,000		

Table 3. Summary of Analytical Results for Metals in Ground-Water Samples Collected August 29, 1988, LCP Chemicals-New Jersey, Linden, New Jersey.

Sample Designation:		MW-1	MW-1A	MW-2	MW-3	MW-4	-----Replicates-----		Field
New Jersey Ground-Water							MW-5	MW-6	Blank
Parameter (ug/L)	Quality Standards (ug/L)								
Antimony	NS	--	BMDL	--	--	--	--	--	--
Arsenic	50	--	76	BMDL	BMDL	13	BMDL	BMDL	--
Barium	1000	350	30	390	350	98	190	190	--
Beryllium	NS	--	--	--	--	--	--	--	--
Cadmium	10	--	BMDL	--	--	BMDL	--	--	--
Chromium (Hex)	50	<10	<10	<10	<10	<10	<10	<10	<10
Copper	1000	BMDL	BMDL	--	BMDL	BMDL	--	BMDL	--
Lead	50	--	--	--	BMDL	BMDL	BMDL	BMDL	--
Mercury	2	--	0.57	--	--	--	--	--	--
Nickel	NS	--	--	--	--	--	--	BMDL	--
Selenium	NS	BMDL	--	--	--	--	--	--	--
Silver	50	BMDL	--	--	--	BMDL	--	--	--
Thallium	NS	--	--	--	--	--	--	--	--

Laboratory Analysis by Environmental Testing and Certification.

ug/L Micrograms per liter.

NS No standard has been established.

-- Not detected.

BMDL Below method detection limit. (Refer to Appendix B)

a Replicate samples from Well MW-5.

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Table 6. Summary of Field Parameters Measured for Ground-water
Samples Collected August 30, 1988, LCP Chemicals -
New Jersey, Linden, New Jersey.

Well	pH (standard units)	Specific Conductance (umhos/cm at 25°C)	Temperature (°C)	Remarks
MW-1A	6.75	11,500	20	Colorless, clear
MW-2	6.85	17,000	17	Red/brown, very turbid
MW-3	7.10	17,500	17	Brown/green, cloudy
MW-4	7.10	19,000	17	Colorless, clear
MW-5	7.00	2,500	22	Colorless, clear

Table 7. Summary of Analytical Results for Metals in Ground-Water Samples Collected August 30, 1988, LCP Chemicals-New Jersey, Linden, New Jersey.

Parameter (ug/L)	New Jersey Ground-Water Quality Standards (ug/L)	Sample Designation:	MW-1A	MW-2	MW-3	-----Replicates-----a		MW-5	Field Blank
						MW-4	MW-6		
Arsenic	50		96	BMDL	12	14	13	BMDL	--
Barium	1000		26	670	310	87	92	140	--
Beryllium	NS		--	--	--	--	--	--	--
Cadmium	10		BMDL	BMDL	--	--	BMDL	--	--
Chromium (Hex)	50		<10	<10	<10	<10	<10	<10	<10
Lead	50		--	--	--	BMDL	--	--	--
Mercury	2		0.59	--	--	--	--	--	--
Nickel	NS		--	--	--	--	--	--	--
Selenium	NS		--	--	--	--	--	--	--
Silver	50		--	--	--	--	BMDL	--	--

Laboratory Analysis by Environmental Testing and Certification.

ug/L Micrograms per liter.
 NS No standard has been established.
 -- Not detected.
 BMDL Below method detection limit. (Refer to Appendix B)
^a Replicate samples from Well MW-4.

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ATTACHMENT #1
PAST OPERATIONS

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ATTACHMENT #1

Item 1B: Past Operations

Prior to UCC-Linde Divisions operations, the property was vacant and owned by GAF. GAF leased the property to Linden Chemical and Plastics (LCP) Inc. who in turn subleased the property to UCC-Linde. In December 1971, LCP purchased the property from GAF. Union Carbide Corporation, Linde Division, operated the Linden facility as a hydrogen transfill and repackaging plant from 1957 to 1989. In January 1989, Union Carbide transferred the assets of this industrial gases operation to a wholly-owned subsidiary, Linde Gases of the Mid-Atlantic, the operation did not change and continued to date.

There are currently 3 - 4 employees at the facility. Operations conducted are as follows:

Hydrogen gas, generated by LCP was delivered to the Linde Plant via pipeline. It was a well known fact that due to the process at LCP, the hydrogen would be contaminated with mercury. The hydrogen was purified prior to containerization by Linde.

LCP stopped supplying pipeline hydrogen in late 1980. Liquid cryogenic hydrogen was then delivered by trailer to the Linde facility and stored in an aboveground 18,000-gallon storage tank. The liquid hydrogen was vaporized to its gaseous form and pumped by compressor through the purification system into DOT approved cylinders and high pressure tube trailers for delivery to customers. Hydrogen product, in cylinders and tube trailers, were then analyzed for conformance with customer or sales specifications. Mixtures of hydrogen and nitrogen or hydrogen and argon were also made upon customer request. In July, 1988, the purification system was removed and the hydrogen was pumped by either compressor or high pressure pump.

Cylinder maintenance activities include: hydrostatic pressure testing of cylinders in compliance with DOT cylinder specifications; valve removal, replacement and repair; and routine brush or roller painting of cylinders as needed.

Routine plant maintenance activities include: periodic dismantlement and

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reassembly of the compressor to repair or replace broken or worn parts, changing lubricating oil on the compressor and vacuum pumps, and welding, cutting and brazing of filling manifolds and equipment.